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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities in the USSR, in the Sino-Soviet Orbit countries, and in Yugoslavia, and is disseminated as an aid to United States Government research.

SCIENTIFIC INFORMATION REPORT

Table of Contents

		Page
I.	Astronomy	1
II.	Chemistry	4
III.	Earth Sciences	25
IV.	Electronics	26
V.	Engineering	40
VI.	Mathematics	43
VII.	Medicine	56
VIII.	Metallurgy	91
IX.	Physics	97
X.	Miscellaneous	139

NOTE: Items in this report are numbered consecutively.

I. ASTRONOMY

1. Uzbek Astronomy

"Astronomy Research in the Uzbek SSR for Forty Years (1917-1957)," by V. P. Shcheglov, Tr. Tashkensk. astron. observ., 1957, 6, 5-15 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya, No 6, Jun 58, Abstract No 3505)

A brief report of the development of astronomical work in the Uzbek SSR for the period 1917-1957 is presented. The astronomical research was basically carried out by two establishments: the Tashkent Astronomical Observatory and the Kitab International Latitude Station imeni Ulugbek. During this period two new laboratories were installed at the Tashkent Observatory: the Laboratory of Time and the Laboratory for Systematic Observations of Solar Activity. Much work was devoted to the study of instruments and the systematic errors of instrumentation. The activity of the observatory followed the following pattern: time service, study of solar activity, observation of variables, and meridian and photographic astrometry. In addition, work in theoretical astronomy and in the history of astronomy was carried on. The observatory participated actively in gravimetric and astronomogeodesic expeditions. The Kitab latitude station was organized in 1929. During its existence it has made over 40,000 latitude determinations. The associates of the station carried out many studies of personal, instrumental, and other systematic errors, occurring in latitude determination with the zenith telescope. Information on work carried out at the Tashkent Astronomical Observatory for 40 years was given in RZhAstr, 1958, No 3, 1557.

2. Lunar Coordinates

"Photographic Observations of the Moon in Pulkovo," by A. A. Mikhaylov and Kh. I. Potter, Tr. 12-y Astrometr. konferentsii SSSR, 1955, Leningrad, Main Astronomical Observatory, Pulkovo 1957, 414-415 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya. No 6, Jun 58, Abstract No 3650)

A method of photographing the Moon simultaneously with stars by means of an opaque screen is described. The screen is located before the picture of the Moon in the focal plane of a standard astrograph. The method of measuring and the processing of plates is briefly described. The observed correction of orbital lunar coordinates $\triangle$ L and $\triangle$ B obtained from 11 plates made in 1955 is tabulated. The possible sources of systematic errors are indicated: refractive anomalies of short duration and inaccuracy in the guidance of the astrograph.

3. Spectrographic Observations

"A Three-Stage Linear Spectrograph," by Yu. V. Glagolevskiy, Tr. Sektora astrobotan. AN KazSSR. 1957, 5, 44-58 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya, No 6, Jun 58, Abstract No 3667)

The operation of a two-stage linear spectrograph of G. A. Tikhov's design is described. By using, instead of nonsensitized plates, panchromatic ones the author obtains an image of the star consisting of three rings, the last of which is due to the decrease of sensitivity of photoplates in the green part of the spectrum. The elementary theory of a three-stage linear spectrograph and the pertinent color scale is presented, as well as the connection with the color scale of the two-stage linear spectrograph and with the spectral classes of stars. For the classification of star images, the areas of Capteyn No 49 and 108 were taken. The observations were carried out in 1954-1955 near Alma-Ata by means of the Bredikhin astrograph. Rays of 4040 wavelength were focused on Astro Platten Panchromatisch photoplates. The diaphragm diameter covering the middle of the objective was 7 cm. All stellar images were divided into ten colors according to their type. For comparison, colors for stars were taken from the catalog of the two-stage linear spectrograph and their spectral class from HD. The obtained relationship was plotted graphically and facilitates determination of the spectral class of the star from its color. This spectral classification best fits the G-M class. For hot stars the deviation in the determination of the spectral class is considerable.

By using the spectrum of Capella obtained with an objective prism the author theoretically computed the profile of its image (distribution of brightness) in the linear spectrograph. By knowing it and by assuming that the brightness in stellar spectra is determined by Planck's formula, the author obtained profiles of stars for temperatures of 14,000°, 7,000°, 4,000°, 3,000° and 2,000°. The theoretical profiles agree satisfactorily with the observed ones except for the red part of profiles for low temperatures, where considerable deviations occur, which probably should be explained by the effect of absorption lines and bands.

4. Radio Astronomy Antenna

"Diagram Modulation," by E. G. Mirzabekyan, Soobshch. Byurakansk. observ., 1957, No 23, pp 3-18 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya, No 6, Jun 58, Abstract No 3779)

The problem of partial polarization of the electromagnetic field in the round waveguide of the emitter at different cross sections of the E- and H-planes of the directivity diagram during observation of nonpolarized emission from a source situated outside the electric axis of the diagram is discussed. If the source is a point source, then during observations

on a polarizing radio meter (RZhAstr; 1957, No 1, 529) a parasitic diagram modulation occurs, the value of which may be either equal to zero or have a maximal value depending on the phase of the reference voltage at any axial traverse of the source through the antenna diagram. For an elongated source (uniform disk) the diagram modulation always occurs except in the case of an axial position of the source. A suggestion is made as to how to make use of a similar effect.

5. Corpuscular Solar Emission

"Corpuscular Solar Emission and Topology of the Magnetic Field in the Solar Corona," by Ye. A. Ponomarev, Fiz. solnechn. korpuskulyarn. potokov i ikh vozdeystviye na verkhnyuyu atmosferu Zemli, (Physics of Solar Corpuscular Streams and Their Effect on the Upper Terrestrial Atmosphere), Moscow, Academy of Sciences USSR, 1957, 69-74, 76-86 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya, No 6, Jun 58, Abstract NO 3808)

The problem of structure and stability of coronal radiative forms during the off-the-Sun motion of coronal matter in the general dipole magnetic solar field is solved. The radial streams with good conductivity in the general magnetic field create in the corona an induced magnetic field $\underline{h}$ which adds to the initial field H_0. The induced field which moves in the coronal stream with a velocity $\underline{u}$ in the initial magnetic H_0 is defined from the equation: $\text{rot } h = 4\pi\sigma 1/c^2 (u \times H_0)$, where σ is the cross-sectional electric conductivity. If we introduce a vector potential and admit that H_0 is the field of the magnetic dipole, situated in the origin of coordinates, it is possible to find the values of the components of the total magnetic field in the corona and therefore to determine the schematic picture of distribution of the magnetic forces under the condition of emission of matter from the equatorial region (the years of minimum) and also from middle and high latitudes (the years of maximum). The qualitative picture of lines of forces coincides with the "minimum" or "maximum" corona type. The magnetic field also determines the stability (with respect to diffusion) of radiative formations of the corona.

In discussion S. B. Pikel'ner remarked that one should consider from where the corpuscles of the stream are coming. If they are coming from the chromosphere, the double phase radiation system will not be subject to acceleration in most of its part. The upward motion will concern only the coronal matter. The observations point rather to the first case.

II. CHEMISTRY

Chemistry and Technology of Fuels and Propellants

6. A. A. Koval'skiy's Work on Reaction Kinetics and Nuclear Physics

"Election of Academicians and Corresponding Members of the Academy of Sciences USSR," (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 9, Sep 58, pp 1135-1154

A. A. Koval'skiy achieved prominence because of his research in the field of kinetics of chemical reactions and nuclear physics. He participated actively in the development of the chain theory. On the example of the oxidation of phosphorus, he established that the upper limit of ignition in chain reactions of oxidation is due to the increased velocity of the reaction of homogeneous chain termination at higher concentrations. A. A. Koval'skiy determined precisely the position of the lower limit of ignition for reactions of the oxidation of hydrogen and of carbon monoxide. Furthermore, he investigated for the first time the kinetics of rapid self-accelerating processes during the period of induction. In the course of this work, he developed original methods for the recording of processes that take place with a high velocity. Fundamental research by Koval'skiy on the upper and lower limits of ignition and the kinetics of rapid oxidation reactions formed an experimental basis for the development of the theory of branched chain reactions. On the basis of work done by Koval'skiy and members of his group on the subject of the high-temperature oxidation of nitrogen, the mechanism of this process, which takes place with the participation of free atoms of nitrogen and of oxygen, was clarified.

The second period of the scientific activity of Koval'skiy was devoted to the investigation of the mechanism of a number of heterogeneous catalytic reactions. On the basis of the precise method of separate calorimetric measurements developed by him, it was shown that some heterogeneous reactions are actually only initiated by the surface while the principal part of the process takes place in the gas phase and proceeds according to a radical chain mechanism. The concepts of the theory of heterogeneous-homogeneous catalysis were definitely substantiated thereby.

Koval'skiy is one of the pioneers in research on the nuclear physics of high-energy particles. Experimental work conducted under his direction, which dealt with the absorption and multiplication of high-energy neutrons, represents a valuable contribution to the development of the so-called optical model of nuclei.

At a general meeting of the Academy of Sciences USSR held 24-28 March 1958 the election of Koval'skiy as Corresponding Member of the Academy of Sciences USSR (in the specialized branch of chemistry) by the Siberian Affiliate of the academy was confirmed on the recommendation of the Department of Chemical Sciences.

7. V. V. Voyevodskiy's Work on the Kinetics of Combustion and the Chemistry of Free Radicals

"Election of Academicians and Corresponding Members of the Academy of Sciences USSR" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 9, Sep 58, pp 1135-1154

V. V. Voyevodskiy is one of the foremost specialists in the field of chemical kinetics and the chemistry of free radicals. He has investigated a number of problems on the theory of combustion, the cracking and oxidation of hydrocarbons, heterogeneous and homogeneous catalysis, and the structure and properties of free radicals.

Voyevodskiy established the significant details of the mechanism of the oxidation of hydrogen, a reaction which represents a classical example of branched chain reactions. His investigations in this field were culminated by the publication in 1949 together with A. B. Nalbandyan of the monograph entitled Mekhanizm Okisleniya i Goreniya Vodoroda (The Mechanism of the Oxidation and Combustion of Hydrogen). Voyevodskiy introduced the concept in regard to the role played by heterogeneous factors into the theory of the cracking of paraffinic hydrocarbons. The concept made it possible to explain a number of phenomena which cannot be understood on the basis of Rice's theory. As a result of the investigation of the structure and properties of free radicals, Voyevodskiy discovered a new type of radical reactions and formulated a quantitative theory of the cracking of olefinic hydrocarbons. In the course of his work on the recombination of atomic hydrogen on surfaces of catalytically active substances, Voyevodskiy discovered two types of stationary processes, viz., low-temperature and high-temperature processes. He also determined the efficiency of the recombination on metallic and oxide catalysts. The results obtained in this work and theoretical treatment of these results led Voyevodskiy, N. N. Semenov, and F. Vol'kenshteyn to assumptions concerning the radical chain nature of heterogeneous catalytic processes. Currently, Voyevodskiy is engaged in the investigation of the structure and properties of radicals in the condensed phase and work on problems pertaining to heterogeneous catalysis.

A general meeting of the Academy of Sciences USSR held 24-28 March 1958 confirmed on the recommendation of the Department of Chemical Sciences the election of Voyevodskiy as Corresponding Member of the Academy of Sciences USSR (in the specialized branch of chemistry) by the Siberian Affiliate of the academy.

8. USSR Work on Solidified Gasoline

"Solid Gasoline," by Prof B. I. Losev; Moscow, Priroda, Vol 47, No 9, Sep 58, pp 38-44

Solidified fuel has acquired importance in different fields of technology and national economy. Among fuels of this type, solid gasoline occupies the first place. Solid gasoline represents a mixture consisting of 95% of liquid gasoline and 5% of a substance which forms a three-dimensional network or honeycomb structure containing the gasoline. A fuel of this type is of advantage, because it can be transported without the use of containers. Solid gasoline can be liquefied by compressing the briquettes with the result that the liquid fuel is squeezed out mechanically.

One of the advantages of solidified gasoline is increased safety with regard to fire, because the fuel does not flow out, thus feeding the fire.

Gasoline can be solidified by different methods. Some of these methods are adsorption of gasoline on porous materials, thickening of the gasoline by substances forming a gel such as agar, gelatin, or soap, and chemical action by suitable substances on an emulsion of gasoline dispersed in water in the presence of an emulsifying agent (e.g., a natural or synthetic high-molecular compound). Methods are known for recovering such emulsifying agents without changing their chemical composition.

Recent patents proposed solidification of gasoline by combining it with a solution of methylcellulose, gelatin, or casein. Some authors recommend addition of free fatty acids, wood rosin, and soda lime for the purpose of saponification to convert gasoline or oil into a solid gel.

Thickening by means of aluminum stearate was also applied for the solidification of liquid fuels. Methods for thickening were originally developed in the USSR on the basis of the application of aluminum napthenate. The work in question was done by A. P. Ionov. Academician P. A. Rebinder acted as consultant. The scientific aspects of the work in question formed the subject of an investigation carried out at the Institute of Physical Chemistry, Academy of Sciences USSR, by A. A. Trapeznikov and N. A. Bakh. Recently, a considerable amount of information was published on the production of thickened gelatinized fuels of the napalm type. To reduce the danger of fire during storage of motor fuels treated in this manner, some investigators proposed to emulsify the fuels with soap containing a minimum quantity of water. It is recommended that emulsions of this type be separated by applying a weak electric current before the fuel is fed into the carburetor of an automobile.

At the Algae Institute (Vodoroslevyy Institut) in Arkhangel'sk, interesting work was done on the use of alginate for the production of materials having the structure of foams. In 1958 data were published on the storage of gasoline in the solid state in capsules consisting of colloidal alginate. To prepare such capsules the gasoline is emulsified in an aqueous alginate solution and the resulting emulsion passed through a partition provided with appropriate orifices into a concentrated solution of calcium chloride. The emulsion then forms semisolid spheres consisting of a gel. These spheres are washed with water, dried, and then supplied to the consumers.

In 1939-1940 Komskiy and Fayntsimer in the USSR developed a method whereby highly concentrated gasoline emulsions are prepared with the use of water-soluble proteins as emulsifiers. These proteins are subsequently tanned with formalin. This method was found to be much superior to similar methods proposed abroad. In addition to gasoline, kerosene, and other fuels derived from petroleum, one may solidify in this manner and obtain in the form of briquettes vegetable oils, some drugs, and also gases (e.g., butane). However, briquettes prepared on the basis of casein could not be stored for prolonged periods of time, so that synthetic resins capable of polymerization or condensation were used subsequently (e.g., polyvinyl alcohol and urea-formaldehyde resins).

As a result of research conducted at the Academy of Sciences USSR, mixtures containing synthetic high-molecular compounds such as urea-formaldehyde resin and polyvinyl alcohol were proposed for use in the production of solidified gasoline. Casein is also contained in mixtures of this type. The casein is dissolved in aqueous ammonia and applied as an emulsifying agent in this form. The urea-formaldehyde resin is solidified by adding oxalic acid. A mixture of three emulsifying agents, viz., casein, urea-formaldehyde resin, and polyvinyl alcohol gives the most satisfactory results. Glycerin may be added to increase the elasticity of the solid films formed by these amulsifying agents.

The solidified fuel has the appearance of solid briquettes of a white or yellowish color [an illustration shows three cylindrically shaped pieces of solidified fuel of different height]. Its specific weight is close to that of the liquid fuel which has been solidified. The content of the liquid fuel in the briquette comprises about 95% by weight while the remaining 5% corresponds to substances which form the structure of the briquettes including water contained in the films. The chief requirements which briquettes of solidified fuels must fulfill are mechanical strength and stability in storage. The liquid fuel contained in the inner spaces of the structure of the briquettes should not flow out or evaporate because the nuclei are destroyed. To protect the briquette externally, it is coated by applying a polyvinyl alcohol solution to its surface.

The solidified fuel is treated before use by mechanical compression resulting in squeezing out of the liquid fuel, distillation of the liquid fuel followed by condensation, or chemical destruction of the briquette. The mechanical method has been found most convenient from the practical standpoint.

The solidified fuel is also used as such during expeditions, e.g., for the preparation of food. On being ignited with a match, the briquette burns slowly and uniformly, yielding a steady flame. Good results were obtained by using this type of fuel in the Caucasus, the Crimea, the Arctic, and the Antarctic. According to reports from a USSR Antarctic expedition, the solidified gasoline assures rapid heating of living space even when there is a violent snowstorm, a temperature of minus 50° to minus 70°C, and a pressure of the external air amounting to 465 mm.

Briquettes weighing 800, 400, or 200 grams are packed in boxes of thick paper or cardboard and supplied to consumers in this form. Wrappings of kraft paper and the use of light wooden crates were found of advantage in transporting fuel briquettes.

Experiments on storing solidified petroleum products showed that solidified gasoline can be buried at a depth of 1.1 meters in the ground. Under such conditions the gasoline briquettes did not freeze during the cold season and did not change during a period of many years. One can store such briquettes in the open throughout the year. Briquettes which have not been packed remain unchanged on being kept for 4 years in bodies of fresh and salt water. However, briquettes which have been kept in water for long periods of time are not as well suited for further storage, on being removed from the water, as briquettes that had not been exposed to the action of water before.

The experiments that have been conducted showed that briquettes of solidified petroleum derivatives can be stored in any locality and under any conditions, so that storage of unlimited quantities of fuel without building special facilities for this purpose becomes possible.

Solidified gasoline is particularly useful for heating the fuel and lubricating oil used on tractor-sled trains under polar conditions. At the low temperatures which prevail, the fuel and oil are subjected to considerable thickening and must be heated to make them fluid.

Chemistry and Technology of Nuclear Fuels and Reactor Construction Materials

9. Processing of Hungarian Uranium Ores

"Research in Connection With the Chemical Processing of Hungarian Uranium Ores," by E. Szabo, M. Fodor, P. Foeldes, F. Molnar, L. Stocker, and M. Vigvari, Department of Chemistry, Central Physics Research Institute, Budapest; Magyar Kemikusok Lapja, No 5/6, May/Jun 58, pp 210-219

1. Investigation of the Chemical Treatment of Hungarian Uranium Ones

The influence of various factors -- concentration and amount of the chemical agent, length of the period of treatment, and temperature -- on the efficiency of the process of treatment with acid and soda was investigated. Experiments involving the use of sulfuric acid are described. The effect of the quality and quantity of the oxidizing agent used on the efficiency of the treatment is the object of a separate study. The authors also considered the question of substituting air for the potassium permanganate, which is required in connection with the treatment with soda and obtainable only through the expenditure of foreign exchange.

A report is given of observations on the effect of the addition of resins during the treatment with soda. It was found that the efficiency increases when the uranium is removed during the course of the process.

2. Procedure for Concentrating With the Aid of the Ion-Exchange Column of Uranium From Solutions Containing Carbonates

Ion-exchange resins are already in general use for the purpose of concentrating uranium from dilute solutions obtained in the processing of uranium ores. The authors investigated the physical and chemical properties of the indigenous Mykion PA resin, which is of a strongly alkaline quaternary ammonium base type, by comparing it with Amberlite-IRA-400 and Lewatit MN resins. Research was conducted for the purpose of obtaining technological information on the concentration of uranium present in solutions containing carbonate. The dependence of breakthrough and saturation capacity on the amount of sodium carbonate and sodium biocarbonate, on the uranium concentration of the solution, on the granulation of the resin, and the rate of throughput was determined. The effect of elution agents of various compositions and concentration (NH_4Cl, NaCl, Na_2CO_3) on the elution of uranium was investigated, and the most effective eluant was chosen. So-called "aging" experiments were carried out in regard to the stability of the resin.

3. Suitability Tests on Ion-Exchange Resins

The method of concentrating uranium out of its sulfuric acid solutions and from sludge was studied with the aid of ion-exchangers. On the basis of the chemical suitability of the tested anion-exchange resins, it could be determined that even weak basic anion-exchange resins, from a chemical standpoint, are suitable for the concentration of uranium from its sulfuric acid solutions.

A study was made of the problems of pretreatment of the sulfuric acid solutions before the sorption, and of the main factors effective in the intermittent counterflow technology. The lowest number of stages was determined for the sorption and desorption process. Tests were also conducted on the sorption from filter sludge (Durchlasschlamm).

4. Investigation of the Ion Exchange of Uranium Solutions in the Fluidized Solids Process

A study of the fundamental concepts of the fluidized solids process was found to be necessary.

In the course of the measurements with distilled water and with uranium solution, the pressure drop and the layer expansion (Schichtausdehnung) of the fluidized solids in the liquid charge was studied as a function of granulation, quality, and initial layer height of the ion-exchange resin, and of the flow velocity of the liquid. The following types of resins were used: Amberlite IRA 410, Lewatit MN, and Mykion PA. The granulation varied from 0.32 to 1.4 mm.

Under the same conditions, the penetration capacity and the course of the penetration curve proved to be less favorable in the case of a fluidized solids bed than in the case of a vertical column. The influence of the individual factors is analogous to that occurring in the case of a static bed. As a consequence of the change of the specific weight which occurs in the resin as a result of ion exchange, the pressure drop in the liquid layer increases in proportion to the amount of liquid transmitted. Because of this linear relationship, the further progress of the exchange process can be followed, and the penetration can be determined and controlled. Several elution curves of the resin bed were also plotted.

10. Synthesis of a New Calcium Uranyl Succinate

"Preparation of a Calcium Uranyl Succinate," by A. B. Bakturov and A. K. Il'yasova, Institute of Chemistry, Academy of Sciences Kazakh SSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 8, Aug 58, pp 1967-1968

A compound of the composition $CaUO_2(C_4H_4O_4)_2 \cdot 3H_2O$ was prepared for the first time. The method for its preparation and its properties are described.

11. Solvent Extraction of Uranyl Perchlorate

"Extraction of Uranyl Perchlorate With Tributyl Phosphate," by V. B. Shevchenko, A. S. Solovkin, and I. V. Shilin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 8, Aug 58, pp 1965-1967

The distribution of water and uranyl chloride in a 1.2 molar solution of tributyl phosphate (TBP) in carbon tetrachloride depending on the concentration of the salt in the aqueous phase was determined. On the basis of the experimental data obtained, it is concluded that uranyl perchlorate is extracted by tributyl phosphate in the form of a compound of the composition $UO_2(ClO_4)_2 \cdot 2H_2O \cdot 2$ TBP

12. The Specific Heats of Uranium Oxides at High Temperatures

"The True Heat Capacities of UO_2, U_3O_8, and UO_3 at High Temperatures," by M. M. Popov (deceased), V. L. Tal'chenko, and M. D. Senin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 8, Aug 58, pp 1734-1737

By applying the method of direct heating with continuous introduction of the heat being measured and using both a metal calorimeter vessel and a vessel made of quartz glass, the true heat capacities of UO_2, U_3O_8, and UO_3 were determined on powdered samples. The temperature dependence of the true molar heat capacities can be expressed by the equation:

for UO_2 in the range	160-603°,	$C_p = 15.29 + 1.716 \times 10^{-2} T - 1.41 \times 10^{-5} T^2$
" U_3O_8 " " "	100-320°,	$C_p = 53.51 + 8.99 \times 10^{-2} T - 1.279 \times 10^{-4} T^2$
" " " " "	400-600°,	$C_p = 64.25 + 1.582 \times 10^{-2} T$
" UO_3 " " "	119-400°,	$C_p = 20.12 + 1.15 \times 10^{-2} T - 4.36 \times 10^{-6} T^2$

13. Uranyl Ferrocyanides

"Concerning Uranyl Ferrocyanides," by I. V. Tananayev and M. I. Levina; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 9, Sep 58, pp 2045-2052

Systems of the types $UO_2(NO_3)_2$ - M_4 $[Fe(CN)_6]$ - H_2O (where M = Li, Na, K, Rb, or Cs) were investigated by the methods of solubility, potentiometric determinations, and measurement of the light extinction.

It was found that in the systems with Li_4 $[Fe(CN)_6]$ and Na_4 $[Fe(CN)_6]$ the compound $(UO_2)_2$ $[Fe(CN)_6]$ is formed while in systems with M_4 $[Fe(CN)_6]$ (where M = K, Rb, or Cs) there is formation of solid phases of the type $M_4(UO_2)_4$ $[Fe(CN)_6]_3$ and of $M_2(UO_2)_3$ $[Fe(CN)_6]_2$ as a solid intermediate phase.

In systems with K_4 $[Fe(CN)_6]$ there is furthermore formation of $K_{12}(UO_2)_8[Fe(CN)_6]_7$ when an excess of the ions $[Fe(CN)_6]^{4-}$ and K^+ (6-8% of K_2SO_4) is present.

14. Solvent Extraction of Thorium

"Extraction of Thorium With Tributyl Phosphate; Part 3. The Effect of $SO_4^{=}$ Ions on the Distribution of Thorium," by Ye. P. Mayorova and V. V. Fomin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 8, Aug 58, pp 1937-1954

It was determined by extraction with tributyl phosphate that sulfate-nitrate solutions of thorium with an ionic strength of 1.7 contain complex ions of thorium with two additives in addition to simple sulfate and nitrate complex ions. The ions with two additives contain one $SO_4^{=}$ ion and no more than 3 NO_3^- ions. The association constants of the complex ions and molecules $Th(SO_4)^{2+}$, $Th(SO_4)_2$, $Th(NO_3)(SO_4)^+$, $Th(NO_3)_2SO_4$, and $Th(NO_3)_3SO_4$ have been determined and found to be equal to 200, 2,500, 1,950, 1,100, and 500, respectively.

15. The Properties of U_3O_8 Crystals

"Investigation of the Structure of U_3O_8 Crystals," by B. Chodura, H. Landspersky, V. Machacek, and Ja. Maly, Institute of Nuclear Physics, Czechoslovak Academy of Sciences, Prague; Moscow, Atomnaya Energiya Vol 5, No 2, Aug 58, pp 181-183

Particles of uranium oxides suspended in ordinary or heavy water are characterized by median lengths of the free paths of fission products which do not exceed 10-15 microns and the fact that when the total surface increases with the reduction of the dimensions of particles, the adsorption and degree of hydration increase (such suspensions are used as nuclear fuel in homogeneous reactors). It is desirable that the dimensions of the particles do not exceed 10 microns; in this case, practically all fission products are removed from them. Because of the importance of the dimensions and other properties of U_3O_8 particles from this standpoint, the effects of the state of the initial uranium compound and of the conditions under which precipitation is carried out (i. e., temperature and the time during which thermal decomposition took place) on the dimensions and composition of U_3O_8 were investigated. The results of the investigation are described in detail.

16. A Review of Work on the Metallurgy of Thorium

"Metallic Thorium," by G. A. Meyerson and A. F. Islankina; Moscow, Atomnaya Energiya, Vol 5, No 2, Aug 58, pp 155-165

A brief review of work on the metallurgy of thorium is given. USSR research on the production of compact thorium by powder metallurgy methods is described. The physicochemical properties of thorium powders and the characteristics of the process of pressing thorium powders obtained by the electrolytic method and by the calcium-thermic method are described. The powder obtained by the calcium-thermic method has worse characteristics with respect to pressing than the powder obtained by the electrolytic method, because it has a lower bulk weight and an increased content of oxide films due to the dendrytic shape of its particles. The principal aspects of the process of sintering are discussed from a theoretical standpoint; correlations are established between changes in the strength and ductility of compact thorium derived from electrolytic and calcium-thermic powders and the temperature and time of sintering.

When briquettes of calcium-thermic powder which do not exhibit open pores are sintered above 1,150-1,200°, they change their shape considerably because of intensive evaporation of calcium. To obtain dense metal from calcium-thermic thorium powder, cold rolling of the sintered briquettes followed by annealing is applied.

17. Review of Methods for the Production of Thorium and Applications of This Element

"The Present-Day Status of the Production and Consumption of Thorium," by G. Ye. Kaplan, Yu. I. Zarembo, and T. A. Uspenskaya; Moscow, Atomnaya Energiya, Vol 5, No 2, Aug 58, pp 147-154

The subject of the production and applications of thorium is reviewed on the basis of USSR and foreign publications (a bibliography consisting of 8 USSR references and 32 non-USSR references is appended to the article). It is brought out that prospects of the application of thorium in the nuclear energy industry and in other fields, for instance, in the manufacture of high-melting magnesium alloys, induced an intensive development of the thorium industry and of research in this field. During recent years, several enterprises at which raw material containing thorium is converted have been built in the US, India, Brazil, and other countries. The extraction of thorium and of rare-earth elements from monazite is carried out mainly by alkaline methods. To produce pure thorium compounds, solvent extraction methods are used extensively. Metallic thorium is produced by the metal-thermic method as well as by the electrolysis of chloride-fluoride or fluoride melts. Compact metallic thorium is produced by the metal-ceramic method or by the method of melting.

18. Review of USSR Work on Plutonium, Uranium, and Their Alloys

"Metal Studies on Plutonium, Uranium, and Their Alloys," by A. A. Bochvar, S. T. Konobeyevskiy, A. S. Zaymovskiy, G. Ya. Sergeyev, V. I. Kutaytsev, N. F. Pravdyuk, and B. M. Levitskiy; Moscow, Atomnaya Energiya, Vol 5, No 1, Jul 58, pp 5-23

This article reviews briefly the main investigations in the field of the metal science of plutonium, uranium, and their alloys which have been conducted in the USSR in connection with the development of nuclear energy technology.

The first part of the article, in addition to describing briefly the properties of metallic plutonium, outlines the general relationships pertaining to the interactions of plutonium with other elements depending on their position in the periodic system.

The second part of the article discusses a number of properties of uranium and the behavior of this metal during cyclic thermal treatment and irradiation as affected by alloying, and mechanical and heat-treatment. The methods of treating uranium by the application of pressure are also discussed.

The third part deals with the effects of irradiation with neutrons on the structure and properties of the metals and alloys discussed.

19. The Decomposition of Plutonium Oxalates Under the Action of Heat

"Pyrolysis of Oxalates of Tetravalent and Trivalent Plutonium," by R. Ye. Kartushova, T. I. Rudenko, and V. V. Fomin; Moscow, Atomnaya Energiya, Vol 5, Jul 58, No 1, pp 24-28

By using a recording Kurnakov pyrometer, the process of the thermal decomposition of oxalates of tetravalent and trivalent plutonium was investigated. The composition of the intermediate products was determined by using a Berg gas burette, by applying the potentiometric titration method, and by using Penfield's method. It was established that freshly precipitated oxalate of tetravalent plutonium loses three molecules of water at 110°. When the oxalate has been kept for 3-4 days, it evolves additionally 1.5-2.7% of $CO + CO_2$ as a result of the action of the alpha radiation emitted by plutonium. Simultaneously, there is partial reduction to trivalent plutonium. In the temperature range of 170-200° two more molecules of water are split off and 13% of $CO + CO_2$ are evolved, while plutonium is reduced to the trivalent state with the formation of what is mainly $Pu_2(C_2O_4)_3 \cdot H_2O$.

At 380° the oxalate is transformed into plutonium dioxide. At 140° the oxalate of trivalent plutonium is completely dehydrated and on being kept at 270° with access of air is transformed into plutonium dioxide. In an inert medium at 330° there is decomposition of the oxalate with formation of oxalate-carbonate. At 460° the oxalate-carbonate is decomposed and oxidation of the trivalent plutonium to tetravalent plutonium (involving formation of plutonium dioxide) takes place.

20. Preparation and Properties of Plutonium Chloride

"Preparation and Properties of Plutonium Halides; Part I. Plutonium Chlorides," by V. V. Fomin, N. A. Dmitriyeva, and V. Ye. Reznikova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 9, Sep 58, pp 1999-2005

It has been established that when microquantities of thorium (UX_1) and plutonium are chlorinated, plutonium is carried over with the CCl_4 stream at a lower temperature than thorium, which indicates that plutonium is chlorinated at a lower temperature than thorium. When UO_2 and PuO_2 are chlorinated with carbon tetrachloride vapor, uranium dioxide is converted into the tetrachloride at 350-450° while the plutonium dioxide is converted into the trichloride at a temperature of about 500°. At the latter temperature, both oxides interact with carbon tetrachloride under formation of chloride and CO_2. At a lower temperature uranium dioxide is chlorinated with the formation of phosgen and carbon dioxide.

The specific weight of plutonium-free chloride determined on the pyknometer was found to be equal to 5.33 grams per cubic centimeter. When hydrochloric acid solutions of plutonium tetrachloride are evaporated in the air at 70-100°, a compound containing plutonium and chlorine in a ratio of 2:3 is obtained. This compound contains water and oxygen. In vacuum this compound loses a part of its water or oxygen.

It has been shown from the thermodynamic standpoint that the existence and formation by a dry reaction of a complex chloride of tetravalent plutonium is possible. It was demonstrated that such a chloride is formed when a mixture of plutonium dioxide and rubidium chloride is heated in a stream of carbon tetrachloride vapor.

21. Extraction of Plutonium With Tributyl Phosphate

"Extraction of Plutonium (IV) With Tributyl Phosphate; Part 1. Dependence of the Distribution Coefficient on the Concentration of Tributyl Phosphate," by V. V. Fomin, Ye. P. Mayorova, M. I. Krapivin, and V. G. Yudina; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 9, Sep 58, pp 2113-2116

It has been established that when the dependence of the logarithm of the coefficient of distribution of tetravalent plutonium on the logarithm of the concentration of tributyl phosphate deviates from a linear relationship, this deviation is brought about by the presence of nonextractable americium, all other conditions being equal. After an appropriate correction has been introduced, the expression

$$\lg \alpha = 2 \lg [TBP]_0 + a$$

is obtained, where α is the coefficient of distribution, [TBP] the concentration of tributyl phosphate in the nonaqueous phase, and a a constant.

22. Complex Compounds of Rare Earth Elements

"The Preparation of Compounds of Some Rare Earth Elements With Hexamethylenediaminetetracetic Acid and Investigation of the Reactions by Which These Compounds Are Formed," by A. A. Kuz'menko, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 8, Aug 58, pp 1829-1837

The electrical conductivity of isomolar mixtures of hexamethylenediaminetetracetic acid and rare earth element salts was investigated (hexamethylenediaminetetracetic acid is a new complex-forming agent recently synthesized at the Scientific Research Institute of Chemical Reagents). Potentiametric titrations with alkali of mixtures of hexamethylenediaminetetracetic acid ("hexa") were carried out. Complex

compounds of the type MHexa and M_4 hexa$_3$ were synthesized. Investigation of aqueous solutions containing hexamethylenediaminetetracetic acid and chlorides of yttrium, lanthanum, cerium, and neodymium showed that in all of these systems there is interaction between the two components with the formation of two types of complex compounds, namely, MHexa and M_4 hexa$_3$.

23. Chlorination of Beryllium Oxide With Carbon Tetrachloride by the Fluidized Solids Method

"Chlorination of Beryllium Oxide With Carbon Tetrachloride," by A. V. Novoselova and K. N. Semenenko; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 9, Sep 58, pp 2213-2214

A laboratory installation for the chlorination of beryllium oxide with carbon tetrachloride by the fluidized solids method in a nitrogen stream is described. Results obtained in experimental work with this installation are outlined briefly. The advantages of the method are pointed out.

24. Treatment of Zirconium Rich Sands in Poland

"Studies on the Selective Enrichment of Baltic Zirconium-Bearing Sands, Part 1," by Karol Akerman, Jan Krajewski, Michal Ryczek, and Klemens Kruszewski, Institute of Light and Rare Metals, Skawina; Warsaw, Przemysl Chemiczny, Vol 37, No 5, May 58, pp 343-349

The paper deals with experiments on the production of zirconium and other valuable metals from sands of the Polish coast. By selective gravitational, electrostatic, and electrodynamic enrichment, concentrates of zircon, magnetite, ilmenite, almandine, and staurolite were prepared. On the basis of these experiments investigation on a large scale, could begin. The experiments will be dealt with in the next paper.

The Baltic deposits of zirconium sands were studied with respect to their chemical and mineralogical values by the Academy of Mining of Kracow (W. Watocki: Piaski granatowe a polwyspu Helskiego na morzy Baltyckim [Blue Sands of the Hel Peninsula], Kracow, 1928) during 1927-1928, during 1938-1945 by German laboratories (Metall u. Erz, 41, 564, 1944; Geol. Rundschau, 29, 287, 1938; Geol. Rundschau, 29, 301, 1938; Z. angew. Mineral., 387, 1939, and during 1947-1953 again in the laboratories of the Mining Academy of Kracow (Hutnik, 14, 150, 1947; E. Sawicka: Mineraly ciezkie w piaskach plazowych polskiego wybrzeza Baltyku [Heavy Minerals in Sands of

the Polish Baltic Coast], Warsaw, 1953), and in the Central Geological Agency in Warsaw (A. Jelinski: Piaski plazowe wybrzeza Baltyku [Beach Sands of the Baltic Coast], Warsaw, 1955). The purpose was to evaluate the amount of useful minerals contained in the sand, mainly zircon. Research is carried out by the Institute of Light and Rare Metals, together with the Research Laboratory of Mechanical Processing of the Main Mining Institute, Research Laboratory of Ore and Mineral Processing of the Academy of Mining and Metallurgy in Kracow, Institute of Petrography and Mineralogy of the Jagellonian University in Kracow, and the Central Geological Agency in Warsaw.

The mineralogical composition of the sand and the various physical properties of the specified minerals, in particular the specific gravity of the heavy minerals as compared with that of quartz, as well as the differences in magnetic and electric properties indicated real possibilities for selective enrichment of this sand.

For example, from the Baltic coast sand near Jaroslaw, considering the raw sand, as 100% it is possible by means of selective enrichment to obtain 1.3% of concentrate containing 50% of $ZrSiO_4$, which corresponds to a 95% yield of useful mineral.

25. Separation of Zr and Hf

"Attempt of Separation of Zirconium and Hafnium by Ion Exchangers," by J. Krynicki; Katowice, Rudy i Metale Niezelazne, No 1, Jan-Mar 56, pp 31-32

Research is under way in the Institute of Nonferrous Metals in Gliwice on the separation of Zr and Hf. Because of their similar chemical properties the separation by classical methods involves difficulties. Among several known methods the institute chose the ion exchange method.

Because under prevailing circumstances the cationite Dowex 50 was unavailable, an attempt was made to find another cationite for replacement. Tests were made with Wofatit P, Escarbo, and Wofatit F. The separation was carried out by chromatographic layer analysis. The results of analysis showed a concentration of 1 gr. Zr in a liter of solution, which agrees with data available in literature. It also indicated the fact that Wofatit F behaves under certain circumstances like Dowex 50. It was also established, as anticipated, that increasing velocity of flow decreases the efficiency of separation, and so does a stronger concentration. It seems that the effect of concentration is stronger than the effect of velocity. Determination of the Zr and Hf content was carried out by means of the chromographic method with the use of Alizarin S. The installation of a new laboratory apparatus for ion exchange which will facilitate separation on a large scale is now in process.

[For additional information on the chemistry and technology of nuclear fuels and reactor construction materials, see Item No 121.]

Industrial Chemistry

26. New USSR Developments in the Field of Polymerized Plastics

"Polymerized Plastics," by N. Yegorov, director of the Leningrad State Institute of Polymerized Plastics; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 105 (405), 3 Sep 58, p 1

A new type of polystyrene has been developed at the Leningrad State Institute of Polymerized Plastics. The new material has half the specific weight of aluminum and is stronger than this metal. It will be used in the construction of planes and automobiles and in the production of refrigerators, radio receivers, and telephones.

By changing the structure of the polymer molecules of polystyrene, workers at the institute have endowed this resin with other valuable characteristics as well. Ordinary polystyrene has a very low electrical conductivity, but can be used only at temperatures up to 80°. By introducing atoms of bromine or chlorine into the styrene molecules, a polystyrene is obtained which withstands temperatures up to 120°. Introduction of luminescent additives makes it possible to produce plastics based on polystyrene which are invaluable for applications in geophysical instruments and other appliances the operation of which involves recordings of radioactivity.

Of great importance is a new type of polyethylene which is distinguished by an increased strength and a higher resistance to heat. It can be used at temperatures up to 120° and is not affected by water or alkalis. A promising use of this polyethylene is as a material for water pipes. The high dielectric constant of this plastic opens up extensive prospects for its use in electrical engineering and in the radio industry.

A method for the industrial production of polyvinyl acetate emulsions has been developed at the institute. Emulsions of this type will be used as adhesives, a vehicles for paints, coatings for tiles and concrete floors, etc.

A method for the production of acetobutyrate cellulose was developed at the institute 3 years ago. This plastic can be applied to advantage as an insulating material and as a material for the construction of automobiles. However, its industrial production has not been organized as yet. Application of the method for the production of polyvinyl acetate emulsion is also lagging: at this stage, it is produced only at the experimental plant of the institute.

Isotope Chemistry

27. Introduction of Hydrogen and Deuterium Into Emulsions

"Brief Communications -- USSR" (unsigned article); Moscow, Atomnaya Energiya, Vol 5, No 1, Jul 58, p 92

At the Physics Institute of the Academy of Sciences USSR, a method has been developed for introducing hydrogen and deuterium into emulsions in the form of a stable hydrogen-containing substance. This method makes it possible to bring the content of hydrogen in the emulsion up to 0.6 X 10^{23} nuclei of hydrogen per cubic centimeter or to introduce 0.3 X 10^{23} of deuterium nuclei into one cubic centimeter of dry emulsion. As a substance of this type lithium acetate ($CH_3COOLi.\ 2H_2O$ or $CD_3COO\ Li.\ 2\ D_2O$) was used.

Radiation Chemistry

28. Kinetics of the Thermal Decomposition of Mixtures of Irradiated and Nonirradiated Strontium Azide

"Characteristics of the Kinetics of Thermal Decomposition of Mixtures of Irradiated and Nonirradiated Strontium Azide," by V. V. Sviridov; Minsk, Doklady Akademii Nauk Byelorusskoy SSR, Vol 2, No 7, Aug 58, pp 291-293

The purpose of the work described was investigation of the topochemical aspects of the thermal decomposition of granular strontium azide activated by exposure to radiation. Ultraviolet light and X rays were used for irradiation. In the experiments with ultraviolet light the kinetics of the decomposition at 126° of samples irradiated for different lengths of time were compared with the kinetics of decomposition of samples that had absorbed the same amount of radiation energy except that a smaller number of grains was irradiated (mixtures in which the ratio of nonirradiated to irradiated grains comprised 1:1, 3:1, and 7:1 were used). Furthermore, the behavior of samples stirred during irradiation was compared with that of samples irradiated without stirring.

It was established that the initial stage of the reaction depends only on the total amount of radiation energy absorbed, while the subsequent stages of the reaction proceed at a faster rate when a greater number of grains has been irradiated.

In the experiments on the effect of irradiation with X rays, the kinetics of the decomposition of nonirradiated SrN_6 were compared with those of irradiated SrN_6 and of a mixture of the nonirradiated sample with the irradiated sample in a ratio of 3:1. It was found that there are two maxima on the rate of decomposition curve of the mixture: one 20 minutes from the beginning of the experiment and one at the expiration of 50 minutes. The first maximum corresponds to that occurring in the case of a totally irradiated sample while the second develops much earlier than the decomposition maximum of the nonirradiated salt.

The data obtained indicate that the thermal decomposition of SrN_6 does not proceed completely independently in individual grains and that the reaction which has begun in activated grains is transferred to those which have not been activated. However, the interaction resulting in this transfer is not very strong, which explains the appearance of two maxima and the unequal effect of equal quantities of ultraviolet radiation distributed over different numbers of grains.

29. Po-α-Be Sources of Neutron Radiation

"Some Methods for the Mass Preparation of Po-α-Be Neutron Sources," by G. S. Komaishko, V. I. Matvienko, V. M. Permyakov, Ye. S. Subbotin, and O. G. Feofilov; Moscow, Atomnaya Energiya, Vol 5, No 1, Jul 58, pp 64-67

Some problems pertaining to the preparation of Po-α-Be sources for the emission of neutrons are discussed. One of the wet methods for the preparation of such sources is described in detail. This method consists in the preparation of homogeneous mixture of polonium and beryllium by filtering a solution of polonium nitrate through beryllium powder followed by drying of the mixture obtained and grinding of this mixture. A method for the preparation of polonium nitrate free of copper carrier is described. The method in question is not suitable for the mass preparation of neutron sources because of the high neutron activity present during the principal technological stage of the process. A dry process representing a modification of the method proposed by R. I. Brean and M. R. Hertz (Physical Reviews, Vol 98, 1955, p 599) is proposed for this purpose. A copper powder containing a known quantity of Po^{210} is weighed out in containers which are then filled with beryllium powder. When the hermetically sealed containers are heated, there is distillation of the polonium, which is distributed homogeneously through the mixture. This method makes it possible to prepare under conditions which assure the safety of the personnel sources of neutron radiation with an output of $(2.1 \pm 2) \cdot 10^6$ neutrons per second per curie of Po^{210}.

Radiochemistry

30. Isolation of Technetium-99 From Molybdenum Irradiated With Neutrons

"On the Isolation of Weighable Quantities of Tc^{99} From Molybdenum Irradiated With Neutrons," by V. I. Spitsyn and A. F. Kuzina; Moscow, Atomnaya Energiya, Vol 5, No 2, Aug 58, pp 141-146

Different methods have been investigated for the separation of technetium from molybdic acid anhydride ($Mo\ O_3$) irradiated with thermal neutrons in a nuclear reactor. A method for the concentration-and separation of technetium has been developed and tried out under laboratory conditions. This method is based on the coprecipitation of technetium with difficultly soluble phosphates and subsequent chromotographic purification from admixtures. Quantities of Tc^{99} of the order of milligrams have been obtained by this method. The separated technetium was identified by means of spectral analysis and by measuring its absolute activity and the maximum energy of beta-radiation emitted by it. Some chemical properties of technetium have been investigated.

31. Review of Work on the Application of Isotopes in the Investigation of Chemical Structure and Reactions

"The Use of Isotopes in the Investigation of Chemical Structure and Reaction Mechanisms," by A. I. Brodskiy; Moscow, Atomnaya Energiya, Vol 5, No 1, Jul 58, pp 52-63

This article discusses the principal methods of applying isotope tracers in the investigation of problems of chemical structure and of the mechanism of chemical reactions. These methods are (1) application of isotopes as tracer atoms, (2) investigation of isotopic exchange, (3) application of the method of isotope dilution, and (4) determinations of the kinetic isotope effect. Each of these methods is illustrated by typical examples from different fields of chemistry. Principal attention is paid to fundamental problems which are not capable of being solved without the application of isotope tracers. A number of examples was taken from work conducted at the author's own laboratory. A bibliography consisting of 32 USSR references and 20 non-USSR references is appended to the article.

32. The Szilard-Chalmers Reaction in Alkyl Iodides

"Some Aspects of the Szilard-Chalmers Yields From Alkyl Iodides," by I. P. Alimarin and K. F. Svoboda [Institute of Nuclear Physics, Czechoslovak Academy of Sciences]; Moscow, Atomnaya Energiya, Vol 5, No 1, Jul 58, pp 73-75

Measurement of the total retention in methyl iodide, ethyl iodide, propyl iodide, and butyl iodide was carried out after these substances were irradiated by means of a polonium-beryllium source of 5 curies. The accompanying gamma-radiation had an intensity of 0.5 roentgen per hour. It was found that methyl iodide has a retention of 100%, ethyl iodide a retention higher than 90%, propyl iodide a maximum retention of 65%, and butyl iodide a retention of 50-60%. The effects of the gamma-radiation background and of the presence of elemental iodine on the Szilard-Chalmers yields are discussed.

33. Mechanism of the Accumulation and Distribution in the Solid Phase of Radioactive Isotopes Formed by alpha-Decay

"Mechanism of the Migration of Radioactive Isotopes Formed as a Result of alpha-Decay," by V. I. Baranov, A. M. Babeshkin, and K. B. Zaborenko; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 9, Sep 58, pp 2200-2209

A mechanism is proposed for the accumulation and distribution of recoil atoms in the solid phase. On the example of radium isotopes, data were obtained on the degree of transfer of radioactive isotopes from the solid into the liquid phase. The experimental data are found to be in agreement with the mechanism proposed.

Organophosphorus Compounds

34. The Synthesis of Nine Organophosphorus Compounds Described

"Synthesis of Octaalkyltetraamidopyrophosphates and Octaalkyltetraamidothiopyrophosphates," by K. V. Nikonorov and Z. G. Speranskaya, Chemical Institute imeni A. Ye. Arbuzov, Kazan' Affiliate of the Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 8, Aug 58, p 964-967

The purpose of this work was to attempt to obtain certain alkylamides of pyrophosphoric and thiopyrophosphoric acid, and to investigate their insecticidal properties. The synthesis of octaalkyltetraamidopyrophosphates and thiopyrophosphates was accomplished by heating the chlorides of tetraalkyldiamidophosphophoric or thiophosphoric acids with the ethyl

esters of tetraalkyldiamidophosphoric acid. Octaethyltetraamidothiopyrophosphate and symmetric tetramethyltetraethyltetraamidopyrophosphate were obtained by the hydrolysis of the chlorides of tetraalkyldiamidophosphonic acid in the presence of triethylamine. The chemical structure and properties of the nine nitrogen containing analogs of pyrophosphoric and thiopyrophophoric acid are given in a table accompanying the monograph.

Miscellaneous

35. New Chemical Organizations in Ukrainian SSR

"The Tomorrow in Ukrainian Chemistry," by A. Rukavishnikov, chief, Division of Chemical Industry, Gosplan Ukrainian SSR, Kiev, Pravda Ukrainy, No 212, 12 Sep 58, p 2

In keeping with the decision to accelerate the development of the chemical industry in the Ukrainian SSR a number of new chemical institutes are to be established in the republic beginning with 1959. Among these are the Coal Chemistry Institute under Gosplan Ukrainian SSR located in Khar'kov, the Division for the Application of Polymer Materials of the Ukrainian Academy of Agricultural Sciences, and the Scientific Research and Design Institute of Machines and Equipment for Processing Plastics and Rubber located in Kiev.

36. New Chemical Institutes and Laboratories To Be Established in Academy of Sciences Ukrainian SSR

"For Development of Chemical Sciences" (unsigned article); Kiev, Pravda Ukrainy, No 201, 30 Aug 58, p 4

To expand the future development of chemical sciences in the Ukrainian SSR, the Presidium of the Academy of Sciences Ukrainian SSR has decided to establish an Institute of the Chemistry of Polymers and Monomers. The institute will be staffed with top scientists of the republic. In a number of other chemical institutes of the republic new laboratories and divisions will be established. For example, in the Institute of Physical Chemistry, a Laboratory of Chain Reactions and Polymerizations will be organized; in the Institute of Gas Utilization, a Division of the Chemical Conversion of Gases will be set up; and in the Institute of Heat Power Engineering, a Laboratory of the Gasification of Fuels will be established. All these institutes are within the network of the Academy of Sciences Ukrainian SSR.

37. General Meeting of Department of Geologicogeographic Sciences, Academy of Sciences USSR, and Election of New Corresponding Members

"General Meeting of Department of Geologicogeographic Sciences, Academy of Sciences USSR" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geologicheskaya, No 9, Sep 58, p 116

A general meeting of the Department of Geologicogeographic Sciences, Academy of Sciences USSR, was held on 17 June 1958. The principal speakers were Academician N. S. Shatskiy, who spoke on "The Movement of the Earth's Surface and Their Origins," and V. V. Belousov, Corresponding Member of the Academy of Sciences USSR, who spoke on "Certain Results and Perspectives on Tectonophysical Research."

After the reports an election of Corresponding Members to the Academy of Sciences USSR in the Department of Geologicogeographic Sciences was held. Those elected were Khabib Mukham Abdullayev, Doctor of Geologicomineralogical Sciences, president of the Academy of Sciences Uzbek SSR; Aleksandr Vol'demarovich Peyve, Doctor of Geologicomineralogical Sciences, deputy director of the Geological Institute, Academy of Sciences USSR; Prof Viktor Aleksandrovich Priklonskiy, Doctor of Geologicomineralogical Sciences, director of the Laboratory of Hydrogeological Problems, Academy of Sciences USSR; Prof Vladimir Ivanovich Smirnov, Doctor of Geologicomineralogical Sciences, professor at Moscow State University; Prof Veniamin Grigor'yevich Bogorov, Doctor of Biological Sciences, director of the Institute of Oceanology, Academy of Sciences USSR; and Prof Ivan Stepanovich Isakov, Admiral of the Fleet.

IV. ELECTRONICS

Communications

38. New Method of Facsimile Recording

"New Method of Facsimile Image Recording," by L. N. Balin, Scientific Research Institute of City and Rural Telephone Communications (NIITS); Moscow, Vestnik Svyazi, No 9, Sep 58, pp 11-12

The new method of facsimile image recording is based on utilization of properties of certain photosemiconductors. The resistivity of photosemiconductors depends primarily on the action of light: in darkness a photosemiconductor might be a good insulator ($\rho = 10^{16}$ ohm cm), but when illuminated its resistivity may decrease to $\rho = 10^{12}$ ohm cm, i.e., decrease 10,000 times. The photosemiconductor material is deposited as a thin layer on the surface of a metal plate. If such a coating is charged in darkness to a certain potential and then is subjected to an uneven illumination, the potential at each point will decrease in proportion to the intensity of illumination at that point. Thus an invisible image is produced, made of electric charges of various intensity. This invisible image can be brought out by dusting the plate with such a material as finely divided asphalt. To intensify the attraction of powder to the plate, the powder is electrically charged with polarity opposite to that of the plate. The visible image can now be transferred to a paper by any suitable method, for example, electrostatic. To fix the image transferred to the paper, it is coated with a thin layer of gelatine or other suitable coating.

Testing has shown that this facsimile method is fully satisfactory from the standpoint of quality of image, economy of operation, and speed of reproduction.

39. Recent Soviet Patents in the Field of Communications

"Authorship Certificates" (unsigned article); Moscow, Elektrosvyaz', No 10, Sep 58, p 78

Class 21a, 36. No 111244 -- A. M. Tseytlin; Device for Obtaining High-Voltage Trapezoidal Pulses

Class $21a^1$, 9_{04}. No 110847 -- V. I. Ponamarev; Electromechanical Band-Pass Filter

Class $21a^1$, 10_{01}. No 111729 -- A. S. Selivanov; Device for Connecting Sector Teletypewriters to the Distributors of Synchronized Apparatuses.

Class $21a^1$, 11_{01}. No 111449 -- B. P. Terent'yev and Yu. V. Bogoslovskiy; Automatized Method of Telegram Reception

Class $21a^1$, 32_{11}. No 111258 -- V. A. Vatsenko, I. Ye. Goron, and V. G. Patrunov; Ferrographic Method of Recording Still Images

Class 21^2, 18_{08}. No 111846 -- I. A. Petrusenko, V. G. Baranovskiy, and V. A. Dunaykin; Push-Pull Magnetic Amplifier With AC Output

Class $21a^3$, 51_{10}. No 110848 -- N. R. Zbar, K. I. Kukk, and I. I. Ebel'; Device for Connecting Twinned Automatic Telephones

Class $21a^3$, 61_{01}. No 111456 -- P. N. Verevkin and A. V. Smirnova; DC Electromagnetic Relay

Class $21a^3$, 67_{30}. No 108437 -- B. N. Voznesenskiy, B. S. Livshits, and S. V. Levina; Device for Relaying of Inductive Pulses of Long-Distance Dialing and Bypassing of Intermediate Amplifier

Class $21a^4$, 8_{01}. No 111812 -- F. A. Vodop'yanov; Tube Oscillator

Class $21a^4$, 8_{02}. No 111737 -- F. A. Vodop'yanov; Wide-Band Tube Oscillator

Class $21a^4$, 13. No 111720 -- G. I. Rukman; Parametric Oscillator

Class $21a^4$, 13. No 111809 -- V. I. Pampuro; Oscillator and Narrow-Band Amplifier With Two Series-Connected Tubes

Class $21a^4$, 14_{01}. No 109765 -- N. A. Zheleznov; Method of Increasing Noise Immunity of Pulse Modulation Radio Lines

Class $21a^4$, 14_{01}. No 111116 -- A. A. Leonov; Method of Obtaining Single Sideband Signal

Class $21a^4$, 46_{02}. No 110721 -- L. N. Deryugin and B. Ya. Myakishev; Diffraction Antenna With Lateral Radiation

Class 21a^4, 46$_{03}$. No 110724 -- V. L. Gendzelevskiy; Room Television Antenna

Class 21a^4, 54. No 111439 -- A. S. Vinitskiy; Method of Multichannel Communication

Class 21a^4, 69. No 110728 -- A. D. Frolov; Oscillatory Circuit

Class 21a^4, 69. No 111220 -- D. B. Kagan and A. K. Konovalov; Device for Automatic Selection of Optimum Coupling With Transmitter Antenna

40. VHF Radio Receiver

"144-146 Mc Radio Receiver," by V. Lomanovich; Moscow, Radio, No 9, Sep 58, pp 29-31

This small-size VHF radio receiver, intended for use by radio amateurs, is built with two separate units. The set uses superminiature tubes with indirectly heated cathode. It can operate from batteries and is therefore suitable for the "Field Day" competitions.

The receiver is designed on the principle of direct amplification; it has a radio-frequency amplification stage, superregenerative detector, and two audio-frequency amplifying stages. The control grid of radio-frequency 6Zh1B pentode is connected to a circuit tuned to a mean frequency of 145 Mc. The antenna is inductively coupled to the receiver. The output circuit of the receiver is tuned with the aid of a capacitor. The superregenerative detector is built with a 6S6B triode having a capacitive feedback.

The demodulated audio-frequency signal is amplified in two stages with a 6Zh1B pentode and 6S6B triode. The headphones are connected to the output of the receiver through a capacitor. The plate current is stabilized with a SG5B "stabilitron." The over-all dimensions of the receiver are 112 X 97 X 56 mm. The power consumption of the heater is about 0.8 a, and that of the plate-grid circuit is 20 milliamperes at 150 v. Sensitivity of the receiver is about 2 microvolts.

The receiver has displayed high sensitivity and reliability under actual operating conditions.

41. Miniature Transistorized Receiver

"Pocket-Size Radio Receiver," by V. Plotnikov; Moscow, Radio, No 9, Sep 58, p 53

The receiver described was awarded the fourth prize at the 14th All-Union Amateur Exposition. This pocket-type transistorized receiver is built on the principle of direct amplification and is capable of receiving broadcasts in the 700-1,800 m range. The receiver has a built-in ferrite antenna and is supplied with power from three FBS-0.25 cells. The receiver is housed in a 28 X 63 X 100 mm plastic case and weighs about 250 g. A capsule microphone DEM-4 is used as a loudspeaker. The two-stage radio-frequency amplifier has two P6G junction transistors with ground emitters. A germanium diode D1A is used as the detector. The three-stage audio-frequency amplifier is assembled with three P6B junction transistors (grounded emitter). To reduce the size of the receiver, ULM-type resistors and EM-type capacitors were used.

42. Utilization of Orthogonal Functions in Communications

"Possibility of Utilization of Orthogonal Function Systems for Purpose of Communications," by A. G. Leont'yev; Moscow, Elektrosvyaz', No 10, Oct 58, pp 3-8

The characteristic peculiarity of functions used as carriers of intelligence is their periodicity and orthogonality. All the modern systems of multichannel communications are based on utilization of functions satisfying formula $\int_a^b \varphi(t) f_m(t) f_n(t) dt$. In this formula $\varphi(t)$ is the weighting function, $f_m(t)$ and $f_n(t)$ are functions of this system, and a-b is the interval of orthogonality. The system with frequency division of channels utilizes the orthogonality of sinusoidal functions. The systems of time division of channels utilize the orthogonality of the periodical sequence of pulses shifted with respect to each other.

But the above-indicated methods of multichannel communication are not the only possible methods. The author discusses the orthogonal function systems of Laguerre and Legendre from the stand point of utilizing them as intelligence carriers. These functions are not periodic, they exist simultaneously, they have an overlapping frequency spectrum, and, as pointed out by D. A. Ageyev, they can be separated by linear methods.

During the construction of an experimental multichannel communication system preference was given to the Laguerre polynomials due to greater simplicity of handling them. The experimental unit built to study the possibility of utilizing the Laguerre function as an intelligence carrier was built with the following units: generator of singular pulses, pulse shaping circuit, modulators, adding device, sync-pulse separator, multiplying device, and integrator.

This system of communication based on Laguerre polynomials might find application in pulse systems of communication and various telemetering systems, where the transmission of a great number of signals is not required.

The author thanks Prof A. A. Kharkevich for his assistance.

43. Review of East German Book on Information Theory

"Book Reviews: Informationstheorie (Information Theory), by P. Neidhardt," reviewed by F. H. Lange; Berlin, Nachrichtentechnik, No 9, Sep 58, p 428

The text of F. H. Lange's review of Informationstheorie (Information Theory), by P. Neidhardt, VEB Verlag Technik, Berlin, 1958, 128 pp, 27 illustrations, calf-bound, 15.- DM, follows.

"The fact that VEB Verlag Technik has, with the publication of this book, filled a glaring gap in the German-language literature is most welcome. The name of the author is closely allied with the development of information theory and its application in television engineering. The reader receives a good insight into the rapid development of the theory of communication during the last decade, which has been made known heretofore only in foreign-language literature and occasional articles. The difficulty with the material is the fact that numerous fundamental concepts of information theory, although known for decades to mathematicians, are strange to the engineer. This stems from the fact that statistics and the theory of probability have been treated very little until now at German universities, in comparison with foreign universities. This circumstance probably makes it difficult for many a reader to grasp fully this succinct text, which, in many places, has more the character of a monograph than a textbook. In the first part, the author gives a survey of several important theorems of the theory of probability and of theoretical statistics, and, in the second part, the basic concepts of information theory. A reading of the text presupposes collaboration on the part of the reader who wants to pursue the subject further, since, in many places, previous knowledge is assumed, which at present is being provided only in the texts of correspondence courses of the Dresden Technische Hochschule. In the

third part, several applications of information theory are treated, primarily on the basis of the concept of information entropy. Here the explanations on the author's own field, i.e., on television applications, are pedagogically successful, whereas the applications in radar, control engineering, telecommunications, and acoustics are treated only briefly.

"This text gives an impressive view of the extent to which the theoretical equipment of the communications engineer has expanded and what a great number of applications have been found through the statistical averages of electronic processes which, with the exception of the effective value, have thus far remained unnoticed in electrical engineering. A reading of the book shows at the same time the necessity of continuing the published series, since no German-language texts have been produced, with the exception of the recent valuable contributions to the field of ultrahigh-frequency engineering, since Kupfmueller, Feldtkeller and Cauer."

44. Coding the Information Theory

"On the Coding Rule of Information Theory," by F. H. Lange, director, Institute for Communications and High-Frequency Engineering, Rostock; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 67, No 1, Jul 58, pp 1-4

The fact is pointed out that the channel capacity C of a transmission channel cannot be computed adequately with the aid of the entropy H of an information source if the flow of information v of the information source, measured in symbols per second, is constant. The rule of optimal coding, $C = H \cdot v$, assumes that the flow of information of the source is variable. An optimal coding occurs in the case of the Morse alphabet which is used to obtain a constant flow of information measured in signal elements per second, in which case a storage device is required between the information source and the coding device. If the use of the storage device is not feasible (as in the case of the usual teletypewriters), an optimal coding must be dispensed with, and the maximum value of the entropy, H_{max}, rather than the entropy H, must be used for the calculation of the channel capacity: $C = H_{max} \cdot v$. Since $H_{max} = \mathrm{ld}\ Z$, and $H = -\mathrm{ld}\ \bar{p}$ ($\mathrm{ld}\ Z$ is the logarithm of the number of possible values the symbols may assume), then only the number of symbols Z, and not their average probability $\bar{p}$, nor the corresponding entropy H, is the determinative factor for the coding and for the dimensioning of the transmission channel. This is the principle of operation of the teletypewriter, the coding of which is often called not optimal from the point of view of information theory. The coding, however, cannot be improved, unless an information storage device is available, since otherwise, in the case of symbols of low frequency, i.e., in the case of unfavorable coding, information would be lost in the transmission channel as a result of "peak overloads" of the flow of information.

[For additional information on computers, see Section VI, Mathematics.]

Wave Propagation

45. Measurement of Very Weak Signals

"Circuit for Measurement of Continuous-Spectrum Weak Signals," by V. S. Voyutskiy and A. I. Slutskovskiy; Moscow, Radiotekhnika, No 9, Sep 58, pp 25-29

The described circuit for measurement of continuous-spectrum weak signals operates on the principle of zero measurement method, and eliminates the effect of internal noises of the instrument and instability of operation of amplifiers. One of the advantages of the circuit is that it does not require complicated modulating devices.

The voltage of the measured signal is fed in-phase to two amplifiers, and the standard signal voltage is fed to the same amplifiers in antiphase. The output from the two amplifiers is fed to a multiplier consisting of a six-terminal network. At the output of the multiplier a voltage appears which is proportional to the product of the two input voltages. Standard signal generators and noise generators with potentiometer dividers at their output were used as the source for the measured signals. The voltage of measured signals taken from the dividers was of the order 0.25-0.5 microvolt. The voltage amplification factor of the amplifiers was to the order 2.0×10^6.

The author asserts that the advantages of the new circuit are evident since the latter is practically unaffected by internal noises.

Components

46. Biharmonic Operation of Multicavity Magnetron

"Possibility of Utilizing Biharmonic Operation of a Multicavity Magnetron," by L. A. Rivlin; Moscow, Radiotekhnika i Electronika, No 9, Sep 58, pp 1216-1218

In generating millimeter frequencies with a multicavity magnetron some difficulties are experienced, the principal one of which is the maintenance of synchronism between electron beam and high-frequency field. The percentage modulation of the electron beam may be increased by utilizing biharmonic

operation of the magnetron in which the modulation of electron beam and high-frequency power lead out is carried out with the aid of two fields having different modes of oscillations.

In the discussed biharmonic operation of the magnetron, the percentage modulation of the electron beam is determined by the high intensity field of high-Q-mode oscillations which increases the effectiveness of interaction of the electron beam with the lesser intensity field of space harmonics having another mode of oscillations, the latter performing the function of high-frequency power lead out. In some respects the circuit of such a magnetron resembles somewhat a multiple-transit klystron with an unloaded low-frequency intermediate cavity. Biharmonic operation can be useful to increase the response to excitation and stability of the magnetron for any frequency range.

47. Study of Directivity of Corner Reflectors

"Analysis of the Directional Properties of a Corner Antenna," by B. S. Nadenenko and V. V. Lyalikov; Moscow, Elektrosvyaz', No 10, Sep 58, pp 26-31

This article describes an approximate method for calculation of directivity pattern of a corner antenna in the plane perpendicular to the edge of the reflector. The directivity pattern in this plane depends on the length of the reflector, but depends very little on the width of the reflector; therefore, it is assumed that the width of the reflector is infinite and the antenna is excited by an infinitely long wire parallel to the z-axis.

A series of formulas were derived for theoretical calculation of corner antenna directivity.

The experimental corner antenna consisted of a 90° corner reflector made from metal sheets and excited by a symmetrical dipole. The dipole was connected through a quarter-wave junction to a coaxial line and was fed from a GSS-12 oscillator.

The theoretically calculated values for directivity patterns of corner antennas were compared with the values obtained from actual measurements, and were found to be in good agreement with each other.

The author thanks V. G. Yampol'skiy for his assistance.

48. Radial Oscillations of Electrons in Traveling Wave Tube

"Theory of Traveling Wave Tube With Consideration of Radial Electron Oscillations," by P. V. Bliokh and M. I. Kaganov; Moscow, Radiotekhnika i Elektronika, No 9, Sep 58, pp 1172-1181

The article discusses interaction of a compensated electron beam with electromagnetic waves in a waveguide filled with anisotropic dielectric material. The exact solution of the problem of interaction of an electron beam with electromagnetic waves in a traveling wave tube is very complex due to the nature of structure of the high-frequency field in a retarding system and intricate nature of electron movement in the beam.

This problem can be considerably simplified if the real retarding system is replaced by a certain medium with a sufficiently high dielectric constant. Graphic analysis of the variance equation has shown that the existence of radial oscillations of electrons, although not manifesting itself in any new significant phenomena, results in substantial changes for conditions of optimum operation of the tube. It was shown that the maximum value of the amplification factor (generation) for a traveling wave tube is somewhat greater when taking into account the existence of electron radial oscillations.

The author thanks Ya. B. Faynberg for his assistance.

49. Transistor Internal Noises

"Calculation of Internal Noises of Transistorized Radio Receivers," by V. V. Pavlov; Moscow, Radiotekhnika, No 9, Aug 58, pp 30-37

The article describes a method for calculation of the internal noise factor of transistorized radio receivers. The author states that the principal limitation for wider application of commercially manufactured transistors is the high level of their internal noises.

The physical nature of internal noises in transistors is more complex than of those originating in vacuum tubes, resistors, or circuits, and therefore cannot be calculated by the method of duality. In this work the internal noise factor is interpreted as the ratio of actual level of noises at the transistor output to that of the output level of noises from an ideal quadripole, both having the same amplification. The noise factor of a transistor does not depend to any appreciable degree on the manner of connection, but depends on collector voltage, emitter current, and frequency. In the frequency range from 0 to 10 kc the noise factor increases with decrease in frequency; in the range from 10 to about 100 kc it remains about constant, and for frequencies above 100 kc the noise level increases with increase in frequency.

The noise factor expressed in decibels for Soviet junction transistors when tested at one kc was as follows: junction transistors P1A, P1B, P1V, and P1G, from 10 to 40; junction transistor P1D, from 10 to 25; junction transistors P1E, P1Zh, and P1I, from 5 to 35; junction transistors P6A, P6B, P6V, and P6G, from 5 to 25; and junction transistor P6D, from 5 to 15.

Computers and Automation

50. Symbolic Programing on Latvian Computer

"Symbolic Programing on an Electronic Computer of the Academy of Sciences Latvian SSR," by E. I. Arin' and M. A. Shneps, Physics Institute, Academy of Sciences Latvian SSR; Riga, Izvestiya Akademii Nauk Latviyskoy SSR, No 6 (131), 1958, pp 100-107

A program for accomplishment of symbolic programing on an electronic computer of the Latvian SSR is presented. The machine itself does not represent a significant modification of the well-known Soviet M-3 computer. For that reason its system of codes was used in the article.

It was indicated that:

1. The machine has a fixed point and 30 columns after the sign column.

2. The machine is a two address computer; the code of operation occupies the six first columns, the first address occupies the seventh through the 18th columns and the second address occupies the 19th through the 30th columns;

3. The memory of the computer has 1,024 cells; the internal accumulator is not specified.

51. Organic Activators for Liquid Scintillators

"Brief Communications -- USSR (unsigned article); Moscow, Atomnaya Energiya, Vol 5, No 1, Jul 58, p 92

At the Radium Institute of the Academy of Sciences USSR the possibility was investigated of using methyl anthranilate, betanaphthol ethers, and other readily available substances as activators for liquid scintillators. It was established that there is a considerable increase in the scintillation effect of a solution of methyl anthranilate in toluence when naphthalene has been introduced. CO has been used successfully for the elimination of oxygen from liquid scintillators. After the oxygen had been removed, a solution of 2.5 grams of methyl anthranilate per liter in a mixture consisting of 3% of methanol, 15% of naphthalene, and 82% of toluene showed an effectiveness of 1.26 as compared with a unit effectiveness assigned to a solution of 5 grams of terphenyl in one liter of toluene.

52. A New Terphenyl Scintillator Mass

"Use of Terphenyl in Beta Counters," by R. V. Semova; Moscow, Atomnaya Energiya, Vol 5, No 2, Aug 58, pp 177-178

Scintillators which are very effective for counting beta-particles have been developed by combining 90-95% of terphenyl with styrene which functions as a binder. The properties of p-terphenyl are compared with those of m-terphenyl. p-Terphenyl was found to be superior to m-terphenyl in the experiments described.

53. A New Organic Scintillator

"Brief Communications -- USSR" (unsigned article); Moscow, Atomnaya Energiya, Vol 5, No 2, Aug 58, p 206

At the Joint Institute of Nuclear Research, a new high-temperature method for the production by polymerization of scintillators having a volume of 3 liters or more has been developed. The new scintillators consist of styrene to which different substances have been added. The best scintillators of this type contain 2% of terphenyl and the substances alpha-NPO and POPOP as additives increasing the density (sdvigayushchiye dobavki).

Acoustics and Audio Frequencies

54. Rule of Formation for Double Tones

"A Rule of Formation for the Determination of the Frequency Spectrum of Involved Double Tones," by W. Grahnert, Clamann and Grahnert Laboratory, Dresden; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 67, No 1, Jul 58, pp 4-18

When rather large exponents are employed, the practical value of the classical method of representing the distortion curve as a power series in the mathematical treatment of nonlinear processes is greatly reduced by the enormously increasing amount of mathematical treatment required. This extra mathematical work is necessary in the partial problem of determining for an individual term of the power series $i_n = k_n u^n$ all new oscillations i_n which result from the involution of the signal u with the whole-number positive exponents n.

This article derives, for a double-tone signal, the general solution of $i_n = k_n u^n$ in the form of a rule of formation. The actual mathematical treatment involves the solution of this binomial consisting of trigonometric terms. With this rule of formation, the double tone is afforded the same possibilities of treatment which now exist for the single tone, for which the rule of formation for $\cos^n \vartheta$ is already known.

Miscellaneous

55. Soviet Patents in the Field of Electronics

"Class 21. Electrical Engineering" (unsigned article); Moscow, Byulleten' Izobreteniy, No 8, 1958, pp 21-35

Class 21a, 24_{02}. No 114562 -- M. M. Gerdov; Superregenerator

Class $21a^1$, 32_{11}. No 114686 -- V. D. Kryzhanovskiy; Synchronization Signals Generation Method

Class $21a^1$, 34_{11}. No 114781 -- B. T. Vol'skiy and V. Z. Beylis; Mixer Device for Combined TV Transmissions

Class $21a^1$, 34_{31}. No 114507 -- Yu. S. Volkov; Screen of a Three-beam Receiving Tube for Color TV

Class $21a^1$, 34_{31}. No 114687 -- I. I. Tsukkerman; Color TV Transmission Device

Class $21a^1$, 35_{21}. No 114504 -- N. A. Isayev and G. N. Potapov; A Method of Shaping and Phasing of Intensifier Pulse

Class $21a^4$, 13. No 114472 -- V. G. Ivanov; Multipulse Blocking Oscillator

Class $21a^4$, 14_{01}. No 114501 -- Yu. G. Polyak and L. B. Shchukin; Device for Obtaining Frequency-Modulated Oscillations

Class $21a^4$, 13. No 114782 -- Yu. S. Milevskiy; Device for Pulse Forming With the Aid of Delay Line

Class $21a^4$, 42. No 114688 -- Yu. L. Simonov; Detector of Amplitude Modulated Signals

Class $21a^4$, 71. No 114493 -- G. G. Bunin and Ye. I. Kalinin; Method of Measuring Frequency Temperature Coefficient in Reflex Klystron

Class $21a^4$, 71. No 114653 -- N. N. Nesvit; Method of Measuring Time Delay.

Class 21c, 54_{05}. No 114718 -- A. V. Ulitovskiy and V. V. Troyanovskiy; Method of Preparation of Resistors From Microwire

Class $21d^2$, 12_{02}. No 114549 -- A. V. Posse; 12-Phase Bridge Rectifier

56. Hungarian Communications Industry Research

"The Signal Technology Industry Research Institute," by Frigyes Komuves; Budapest, Fizikai Szemle, No 6, 1958, pp 197-199

The Signal Technology Industry Research Institute (Hiradastechnikai Ipari Kutato Intezet) was given its present form in 1953. The nucleus of it is still that laboratory which United Incandescent once set up and is now known as the Imre Brody Laboratory of the institute.

The institute now has four laboratories: the Imre Brody Laboratory (Brody Imre Laboratorium), the Electronic Laboratory (Elektronikus Laboratorium), the Transmitter Tube Laboratory (Adocsolaboratorium), and the Parts Laboratory (Alkatreszlaboratorium). The laboratories have chemical analysis, spectroscopy, and X-ray materials-testing groups attached to them.

In connection with the Imre Brody Laboratory, the following work is worthy of special note: theoretical and experimental work dealing with luminescence (Zalan Bodo, Gyorgy Szigeti, Elemer Nagy, and Janos Szabo); experimental and practical work dealing with electroluminescence phenomena (same men as above); and the work with semiconductors and practical uses of them, particularly as far as germanium transistors and germanium diodes are concerned (Zalan Bodo, Ivan Szep, and Gyorgy Szigeti). There is significant work being done in investigating the crystal structure of tungsten metal (Tivadar Millner). Examinations of the ignition characteristics of fluorescent lamps was of practical advantage (Gyorgy Lakatos and Imre Szemzo). An examination of the properties of aluminum oxide semiconductors made possible a significant improvement in the quality of radio tubes (Tivadar Millner, Andras Hegedus, and Kalman Sasvari).

In connection with the Electronic Laboratory one must mention work on physical processes taking place in electronic tubes, primarily on metering techniques of various noises and on discovery of their origins and those which are applicable to microphones (Ivan Peter Valko and Adam Kemeny). The study of the emission state of cathodes was also profitable (Ferenc Fischer and Gyorgy Solt). The work of the laboratory was extended to other metering and application problems for transistors and electronic tubes.

The Transmitter Tube Laboratory does very important technological work for industry and has done work in the area of gas discharge physics (Istvan Koncz and Vilmos Ereky), on methods for observing grid emissions (Vilmos Ereky), on the getter effect of titanium metal (Istvan Koncz and Zoltan Tomaschek), and on a refinement of spectroscopy methods (Bruno Vorsatz).

The Parts Laboratory works primarily on problems of radio resistors and capacitors, doing basic work in the physico-chemical processes connected with the operation of electrolytic capacitors. In cooperation with the Mathematics Institute of the Hungarian Academy of Science this laboratory has done theoretical and metering work on the conductivity of solid resistors (Janos Katona).

In the last 5 years, the institute has achieved quite visible advantages for industry: Hungary still holds its leading place in the area of tungsten technology, the quality and economy of fluorescent lights has been improved, Hungarian industry can now start production of transistors (acknowledging the great help received from Soviet industry), the quality and variety of Hungarian electronic tubes has improved, and the Hungarian parts industry can now support the signal and instruments industry. There has also been much basic work, especially in the area of solid state physics.

V. ENGINEERING

57. Programed Remote Control Lathe

"Self-Adjusting Machine With Programed Remote Control," by V. Pospelov; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 29 Aug 58, p 4

Final tests were completed at the Scientific Research Laboratory of Electroautomatics on an automatic lathe equipped with programed remote control. A demonstration and description of equipment operation were given by V. Bikhman, Candidate of Technical Sciences and director of the laboratory with the assistance of Senior Designer I. Berklayd and Engr S. Chuchuk.

The new system of automatic control provides for complete automation of tool feed, correction for wear, and replacement of worn tools. Complete working procedure is controlled by means of a perforated programing tape. Lathe operation is observed in the control room from two television screens, one giving a close-up view of the cutting tool operation and the other a general view of the course of the tool.

The new system of control is the result of a 2-year project to develop an automatic remote control system for boring and turning machines. Other equipment has been developed suitable for lathes and certain other machines where remote control is desirable.

58. New High-Pressure Hydrogen-Cooled Turbogenerators

"Experimental Turbogenerator With Internal Three-Atmosphere Pressure Hydrogen Cooling of Stator and Rotor Windings," by L. Ya. Stanislavskiy, Khar'kov Plant of Diesel-Locomotive Electrical Equipment; Moscow, Elektrichestvo, No 9, Sep 58, pp 30-34

"In 1958 the Khar'kov Plant of Diesel-Locomotive Electrical Equipment will manufacture the first two Type TGV-200 turbogenerators of 200,000-kw capacity; their series production will begin in 1959. At the same time the plant is getting ready for the production of Type TGV-300 turbogenerators of 300,000-kw capacity. These generators will have internal cooling of stator and rotor windings with an increased hydrogen pressure and will incorporate a series of other constuctional features."

2. Faculty for Strong-Current Engineering, with institutes for electric motor drives and rails, electrical apparatus and installations, chemistry (electrochemistry and galvanochemistry), electric power engineering, high-voltage engineering, electric machine building, and electrical heating

3. Faculty for Weak-Current Engineering, with institutes for electrical acoustics, telecommunications, high-frequency engineering and electron tubes, electromedicine and radiology, electronics, and control engineering.

4. Faculty for Precision Mechanics and Optics, with institutes for precision instrumentation, illumination engineering, general and optical measurements, optics and electron optics, cinematography and photography, and kinematics.

5. Faculty for Technology, with institutes for materials science and nondestructive materials testing, manufacturing, vacuum engineering, norms and standardization, technology and organization, and economics and finance.

The following institutes are not connected with any faculty: the Institute for Social Sciences, the Language Department, and the Physical Education Department. An Industrial Institute is also attached to the Advanced School.

In the 35 institutes and departments there are 22 professors and 142 associates, docents, and assistants. At present, 1,524 students are enrolled, including 57 foreign students from Egypt, Bulgaria, China, Czechoslovakia, India, Korea, Poland, Syria, and the USSR. Including administration personnel, there are about 2,100 people connected with the school. The rector of the school is Prof Dr Stamm.

VI. MATHEMATICS

61. Stability of Solutions for Systems of Differential Equations

"On the Stability of Solutions of Systems Close to the Periodic," by V. G. Shtelik, Mathematics Institute, Academy of Sciences Ukrainian SSR; Kiev, Dopovidi Akademiy Nauk Ukrains'koy RSR, No 6, 1958, pp 598-601

The author examines the system $dx/dt = A(\theta,\tau)x$, where $d\theta/dt = \nu(\tau)$, $\tau = \epsilon t$, and where $A(\theta,\tau)x$ is real, periodic matrix with respect to θ with the period w_1, which is continuously differentiated according to θ and τ, and bounded respect to τ for all $t \geq t_0 \geq 0$. This makes it possible to find a linear unparticular transformation reducing the initial system to the form

$$dy/dt = P(\tau)y + \epsilon P_1(\theta,\tau)\, y, \text{ or to the form}$$

$$du/dt = Cu + \epsilon C_1(\theta,\tau)\, u \text{ where}$$

$$P(\tau) = \beta^{-1}(\theta,\tau)\, A(\theta,\tau)\, B(\theta,\tau) - B^{-1}(\theta,\tau)\, \partial B/\partial\theta\nu(\tau),$$

$$P_1(\theta,\tau) = -B^{-1}(\theta,\tau)\, \partial B/\partial\tau \text{ and } C_1(\theta,\tau) = B_1^{-1}(\tau)\, P_1(\theta,\tau)\, B_1(\tau)$$

which permits obtaining sufficient conditions for the stability and instability of the solutions of the initial system in the Lyapunov sense.

62. Necessary and Sufficient Conditions for the Stability of a System of Differential Equations

"Eiserman's Problem in the Case of Three Simultaneous Differential Equations," by V. A. Pliss; Moscow, Doklady Akademii Nauk SSSR, Vol 121, No 3, 21 Jul 58, pp 422-425

Three differential equations of the Ayzerman (Usp. Matem. Nauk, Vol 4, No 4, 1949) type were considered in the following system of equations:

$$\begin{aligned} dx/dt &= f_1(x) + a_{12}y + a_{13}z, \\ dy/dt &= a_{21}x + a_{22}y + a_{23}z, \\ dz/dt &= a_{31}x + a_{32}y + a_{33}z. \end{aligned} \tag{1}$$

This system, by a linear transformation of the unknown variables and the function $f_1(x)$, is brought to the form

$$dx/dt = y + f(x),$$

$$dy/dt = z + ax + bf(x),$$

$$dz/dt = cx + df(x).$$

With respect to the function $f(x)$, we will assume that it satisfies the uniqueness condition for solution of the system (2) and by the generalized conditions of Hurwitz:

$$f(0) = 0, \quad f(x)/x < 0, \quad d(f(x)/x) + c < 0,$$
$$bf^2(x)/x^2 + (a + d) f(x)/x + c > 0 \quad \text{for } x \neq 0. \tag{3}$$

In the present work the necessary and sufficient conditions are imposed on the parameters a, b, c, and d of the system (2) for the zero solution of this system to be stable on the whole for any nonlinearities of $f(x)$ satisfying the generalized conditions of Hurwitz. In the cases when the parameters of the system (2) do not satisfy these conditions such nonlinearities of $f(x)$ subordinate to the conditions (3) are indicated that the zero solution of system (2) is not indicated stable on the whole.

Thirteen theorems are then stated in the article which give the necessary and sufficient conditions for the stability of the zero solution of system (2) for any nonlinearities of $f(x)$ satisfying the generalized conditions of Hurwitz.

63. The Second Differential Equation of Painleve

"Concerning the Second Transcendental of Painleve," by N. P. Yerugin, Academician, Belorussian SSR; Minsk, Doklady Akademii Nauk BSSR, Vol II, No 4, May 58, pp 139-142

The second equation of Painleve, namely,

$$\frac{d^2W}{dz^2} = 2W^3 + zW + a, \tag{1}$$

is considered where a is a constant.

It is well known that the solutions of equation (1), the meromorphic functions, in the quality of the removable singular points, have poles of the first order with residues ± 1. A general representation of one class of solutions depending on one arbitrary constant is obtained for $a = 1/2$ and $a = -1/2$.

We further see that these classes of solutions have an infinite set of poles the residues of which are of one sign. An asymptotic distribution of these poles was given.

64. Integrals of Common Differential Equation Systems

"Concerning Integrals of Common Differential Equation Systems," by N. P. Yerugin, Academician, Academy of Sciences Belorussian SSR; Minsk, Doklady Akademii Nauk BSSR, Vol II, No 4, May 58, pp 143-146

Let there be given a system of differential equations.

(1) $dx_k/dt = P_k(x_1, x_2, \ldots, x_n, t) \quad (k = 1, \ldots, n)$

where $P_k(x_1, \ldots, x_n, t)$ are rational functions relative to t. The work deals with the problem of finding all independent integrals of system (1) not depending on t.

65. Boundedness of Singular Operators

"Concerning the Boundedness of Singular Operators," by T. G. Gegelia, Tbilisi Mathematics Institute imeni A. M. Razmadze, Academy of Sciences Georgian SSR; Tbilisi Soobshsceniya Akademii Nauk Gruzinskoy SSR, Vol 20, No 5, May 58, pp 517-523

The designations and purpose of the paper are stated below:

Let P, Q, and O be points of the n-dimensional Euclidean space, and let E be a bounded, measurable set of this space.

If $P = (x_1, \ldots, x_n)$ and $Q = (y_1, \ldots, y_n)$, we will designate the point $(\alpha x_1 + \beta y_1, \ldots, \alpha x_n + \beta y_n)$ by $\alpha P + \beta Q$, where α and β are real numbers. We designate by one and the same letter C any positive constant independent of the base variables and we designate variables dependent only on the base variable x by C_x, etc.

We say that the measureable function $\gamma(Q)$ on the set E belongs to the class L_p (E, (Q)'), where (Q) is a measurable, nonnegative function on E, if

$$\int_E \rho \quad (Q) \left| \varphi \ (Q) \right|^p dQ < \infty.$$

Let w(Q) be an essentially bounded measurable function defined on the unit spherical surface σ having its center at the origin of coordinates and

$$\int_\sigma w(Q)\, d\sigma_Q = 0.$$

We consider the operator

$$S\varphi(P) = \int_E \frac{w(\Theta)\,\varphi(Q)}{r^n(Q, P)}\, dQ \qquad (1)$$

where r(Q, P) is the distance between the points Q and P,

$$\Theta = \frac{Q - P}{r(Q,P)} \in \sigma,$$

(Q) is a function defined on the set E, and the integral is understood in the sense of the principal value according to Cauchy.

S. G. Mikhlin (Uspekhi Matematicheskikh Nauk, Vol 3, No 3, 1948, pp 29-112; and DAN SSSR, Vol 117, No 1, 1957, pp 28-31) and A. Kalderon and A. Zygmund (Acta Math., Vol 88, No 1-2, 1952, pp 85-139) proved that the operator S, defined by formula (1) is a bounded operator in the space $L_p(E)$.

The purpose of the present article is to prove the boundedness of the operator S in the space L_p (E, ρ (Q)) for certain ρ (Q).

66. Nonoscillation of Fourth Order Equations

"On the Problem Concerning Nonoscillation for Linear Equations of the Fourth Order," by Ye. S. Chichkin, Kazan' State University imeni V. I. Ul'yanov-Lenin; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Mathematika, No 3 (4), May/Jun 58, pp 248-250

The conditions are stated for any nontrivial solution of the equation

$$Y^{IV} + A(x)\,Y = 0$$

to have no more than three zeros in the given interval (a, c). These conditions take the form of differential inequalities, analogous to the conditions of Azbelev presented in 1955 for equations of the second order. The results of the work are based on the conditions of solvability of the problem of Chaplingin.

67. Boundary Value Problem Encountered in Theory of Elasticity

"Concerning One Boundary Value Problem for a Biharmonic Equation Encountered in the Theory of Elasticity," by A. F. Khrustalev and B. I. Kogan, Khar'kov Automobile Road Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy Matematika, No 3 (4), May/Jun 58, pp 241-247

Solution is considered of one type of axially symmetric problems of the theory of elasticity for an infinite, circular cylinder which leads to the determination of the pressure function $\gamma(r,z)$ satisfying the biharmonic equation

$$\nabla^4 \gamma(r,z) = 0 \qquad (1)$$

in the cylindrical coordinate system, and the boundary conditions

$$\sigma_r = \frac{\partial}{\partial z}\left(\nu\nabla^2\gamma - \frac{\partial^2\gamma}{\partial r^2}\right) = 0 \quad \text{for } r = R;\ 0<z<+\infty, \qquad (2)$$

$$\tau_{rz} = \frac{\partial}{\partial r}(1-\nu)\nabla^2\gamma - \frac{\partial^2}{\partial z^2} = 0 \quad \text{for } r = R;\ -\infty<z<+\infty, \qquad (3)$$

$$\alpha\sigma_r + \beta u = \chi \quad \text{for } r = R;\ -\infty<z<0, \qquad (4)$$

where $u = -\frac{1+\nu}{E}\frac{\partial^2\gamma}{\partial r\partial z}$ are certain constants, and

$$\alpha > 0;\ \beta > 0.$$

The method of solution discussed in the article is based on the results obtained in the works of the Soviet scientist I. G. Al'perin and B. I. Kogan which appeared in 1950 and 1956, respectively.

68. Integral Curves for a System of Two Differential Equations With Holomorphic Right Sides

"Asymptotic Representation of Integral Curves in the Case of Focus," by A. N. Yerugin; Minsk, Doklady Akademii Nauk BSSR, Vol 2, No 6, Jul 58, pp 234-237

A system of two differential equations with holomorphic right sides is considered. When the characteristic equation of the system has only pure imaginary roots, then, as is known, we have either a center or a focus. In addition, it is known that passing to polar coordinates enables the differential equation to be expressed in the form

$$\frac{dr}{d\theta} = Q_n(\theta)\, r^n + Q_{n+1}(\theta)\, r^{n+1} + \ldots + Q_{n+k}(\theta)\, r^{n+k} \ldots,$$

where n is greater than or equal to 2, and the $Q_{n+k}(\theta)$ are polynomials in $\sin\theta$ and $\cos\theta$.

Every polynomial in $\sin\theta$ and $\cos\theta$ may be expanded in a terminating Fourier series. If on this expansion the polynomial has a free term, we will call it a K-polynomial, and if it does not have a free term, we will call it a T-polynomial. It is clear that the product of the two T-polynomials

$$T_1 = \sum_{k=1}^{S_1} (a'_n \cos kt + b'_k \sin kt);$$

$$T_2 = \sum_{k=2}^{S_2} (a''_k \cos kt + b''_k \sin kt)$$

is, generally speaking, a K-polynomial with the free term

$$a_0 = C(T_1 T_2) = \frac{1}{2\pi} \int_0^{2\pi} T_1 T_2\, dt = \sum_{k=1}^{S} (a'_k a''_k + b'_k b''_k);$$

$$S = \min(S_1, S_2).$$

The equations of the integral curves for the indicated system in the case of a focus were obtained in the work.

69. Periodic Solutions of Quasi-Linear Differential Equations

"Concerning Periodic Solutions of Quasi-Linear Differential Equations in One Class of Cases," by I. M. Volk, Kuybyshev Industrial Institute imeni V. V. Kuybyshev; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 3 (4), May/Jun 58, pp 31-40

The sufficient conditions are established for the existence of a periodic solution for a system of n quasi-linear differential equations of the first order which have been solved for the derivatives. In addition, a method of constructing this solution in the form of certain series is indicated. The conditions are imposed only on the coefficients of the corresponding system of linear homogeneous equations and guarantee the existence of a unique solution for an arbitrary choice of the remaining terms in the equations of the quasi-linear system. In addition, the existence is that which is not excluded from the class of systems in which the assumed criteria pervade and in which the right sides of the equations are transformed to zero or to infinity during transformation of the small parameter to zero.

70. An Estimate of the Error Introduced by Approximate Methods of Solving Integral Equations

"Notion of the Resolvent of the Sum of Two Kernels," by I. P. Mysovskikh, Leningrad; Moscow, Matematicheskiy Sbornik Novaya Seriya, Vol 46 (88), No 1, Sep 58, pp 77-90

A detailed account is given of the first part of the paper "Several Formulas of the Fredholm Formalism and Their Application to the Problem Concerning the Estimate of the Error of Approximation Methods for the Solution of Integral Equations," which was read by the authors at the Third All-Union Mathematical Congress held in Moscow, June 1956.

71. Improved Estimate for Moduli of Smoothness

"Inverse Theories of the Constructive Theory of Functions in the Spaces L_p' $(1 < p < \infty)$," by M. F. Timan, Dnepropetrovsk; Moscow, Matematicheskiy Sbornik, Novaya Seriya, Vol 46 (88), No 1, Sep 58, pp 125-132

"Let $E_n(f)_{L_p}$ designate the best approximation of the function $f(x) \in L_p$ by means of trigonometric polynomials of order less than or equal to n in the metric of the space L_p, i.e.,

$$E_n(f)_{L_p} = \inf_{T_n} \| f(x) - T_n(x) \|_{L_p}. \qquad (1)$$

The functions $f(x) \in L_p$ in the metric of the corresponding space are called the modulus of smoothness of order k (k is a whole number greater than or equal to 1) to the function

$$w_k(f;t)_{L_p} = \sup_{|h|<t} \| \Delta_h^k f(x) \|_{L_p} = \sup_{|h|<t} \left\{ \int_0^{2\pi} \left| \sum_{\nu=0}^{k} (-1)^{h-\nu} C_k^{\nu} f(x+\nu h) \right|^p dx \right\}^{1/p}$$

After the above text two theorems were proved which give an improved estimate for moduli of smoothness in a series of cases for $1<p<\infty$.

L_p designates the space of all periodic functions f(x) of period 2π for which $\|f\|_{L_p} = \left\{ \int_0^{2\pi} |f(x)|^p dx \right\}^{1/p}$ for $1 \leq p < \infty$ and $\|f\| = \text{vrai} \sup_{0 \leq x \leq 2\pi} |f(x)| < \infty$ for $p = \infty$.

72. Eigen Function Expansions

"Sufficient Conditions for the Expansion of a Function in an Absolutely and Uniformly Convergent Series of Eigen Functions," by V. A. Il'in; Moscow, Matematicheskiy Sbornik, Novaya Seriya, Vol 46 (88), No 1, Sep 58, pp 3-26

A result is obtained which can be used during consideration of the so-called "conjugate" problems.

The solution of any equation of mathematical physics (equations of oscillation or heat conductivity) in a region g, consisting of two different mediums separated by the boundary C, satisfies the conditions a theorem proved in the work (the solution itself is continuous, the normal derivatives have jumps on the boundary C, and the second derivatives are piecewise continuous). In this manner the solution of a

problem having a nonhomogeneous medium may be expanded in an absolutely and uniformly convergent series of eigen functions corresponding to a problem having a homogeneous medium.

73. Mechanical Quadratures

"On Mechanical Quadratures With Equal Coefficients for the Integrals $\int_0^\infty e^{-x} f(x)\,dx$ and $\int_{-\infty}^{\infty} e^{-x^2} f(x)\,dx$," by B. I Krylov, Academician, Academy of Sciences Belorussian SSR; Minsk, Doklady Akademii Nauk BSSR, Vol 2, No 5, Jun 58, pp 187-192

Quadrature formulas with equal coefficients

$$\int_a^b (x)\, f(x)\,dx \approx C_n \sum_{k=1}^{n} f(x_k) \qquad (1)$$

are called Chebyshev formulas if they give an exact result for every polynomial whose degree does not exceed the number n. In recent years H, Solzer, J. of Math. and Phys., Vol 34, No 1, 1955, calculated the abscissae for the following two forms of such formulas:

$$\int_0^\infty e^{-x} f(x)\,dx \approx 1/n \sum_{k=1}^{n} f(x_k) \quad \text{and} \qquad (2)$$

$$\int_{-\infty}^{\infty} e^{-x^2} f(x)\,dx \approx \sqrt{\pi}/n \sum_{k=1}^{n} f(x_k). \qquad (3)$$

Calculations were accomplished for all values of n from 1 to 10. It turns out that among the x_k complex values for formula (2) occur for 3 less than or equal to n less than or equal to 10 and formula (3) for 4 less than or equal to n less than or equal to 10.

One may expect that complex x_k will be necessarily existent for both formulas for all n greater than 10.

The estimates made in the article indicate that this in fact is the case.

74. Representation Found for One Class of Holomorphic Functions

"On a Class of Functions Unifoliate in the Circle $|z| < (\sqrt{2})^{-1}$," by L. O. Dunduchenko, Kiev Polytechnic Institute; Kiev, Dopovidi Akademiy Nauk Ukrains'koy RSR, No 6, 1958, pp 595-597

One class of functions, holomorphic in a unit circle and unifoliate in the circle $|z| < (\sqrt{2})^{-1}$, is represented by the formula

$$w = \iint_{(\Delta)} z\, G\, (d\sigma)/(1-\zeta z) + z + \sum_{n=2}^{+\infty} a_n z^n,$$

where the integral should be taken in the sense of a two-dimensional Stiltjes integral. In this class of functions, precise upper and lower estimations have been set up for

$$|w| , |w'| , |\arg w/z| , |\arg w'| , |a_n| .$$

Extremal depicting functions are given.

75. Method of Oscillating Functions Used for Approximate Solution of Nonlinear Differential Equations of the Second Order

"Application of the Oscillating Function Method for the Approximate Solution of Initial and Boundary Value Problems for Nonlinear Differential Equations of the Second Order," by N. V. Sharkova, Perm' State University imeni A. M. Gor'kiy Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 3 (4), May/Jun 58, pp 251-255

The method of oscillating functions, proposed by S. I. Mel'nik and applied by him for approximate solution of integral equations, differential equations, of the first order, and linear differential equations of the second order having the Cauchy initial conditions, may also be applied for the approximate solution of nonlinear differential equations of the second order with initial conditions and for certain boundad, boundary value conditions.

76. Linear Nilpotent Groups

"Linear Nilpotent Groups With an Abelian Commutant," by R. Tyshkevich; Minsk, Doklady Akademii Nauk BSSR, Vol 2, No 6, Jul 58, pp 231-233

After making a resume of the four existing works by the Soviet mathematician Suprunenko, the author stated the following:

"We naturally have made an attempt to describe irreducible nilpotent groups of the third class, and on the other hand, groups of an arbitrary class, whose degree is the square of a prime number. By this method we arrived at groups with an Abelian commutant for which a theorem was proved in accordance with the theorem of Suprunenko concerning meta-abelian groups."

All the invariants were found for nilpotent groups of the third class and for groups of an arbitrary class the degree of which does not have cubic divisors.

77. Group Algebra

"P-Blocks for One Class of Finite Groups," by S. D. Berman and A. A. Bovdi, Uzhgorod State University; Kiev, Dopovidi Akademiy Nauk Ukrains'koy RSR, No 6, 1958, pp 606-608

The following is a summary of this article:

Let G be a group of order $p^a q$, where p is a prime number and (p,q) = 1. Let G contain a normal subgroup H of order $p^r q$ ($0 \leq s \leq a$), the p-Sylow subgroup of which is a normal divisor of the subgroup in H.

Let T be the maximal normal subgroup of G with order $m \not\equiv 0 \pmod{p}$. Let R (G, K) denote the group algebra of group G over the arbitrary field K of characteristic p.

Then the number of indecomposable constituents in the direct two-sided decomposition of the algebra R (G, K) is equal to the number of classes of K-conjugate elements of group G which lie in T (for the definition of the classes of K-conjugate elements see the article by Berman, DAN SSSR, 106, 5, 767, 1956). Two irreducible ordinary characters χ_i and χ_j belong to the same block if and only if χ_i and χ_j induce the same character over T.

78. Entropy of Markoff Chains

"On the Entropy of Markov (Markoff) Chains," by G. A. Ambartsumyan, Yerevan Polytechnic University imeni K. Marks; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Vol 11, No 2, 1958, pp 31-40

In mathematical and technical literature one encounters various definitions for entropy of Markoff chains. In the first part of the above work the connection between these definitions is established for complex chains. In the second part the limit theorem of Khinchin is generalized for simple chains on complex Markoff chains of any order.

79. An Optimum Algorithm

"Concerning the Choice of an Optimum Algorithm," by Yu. I. Zhuravlev, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 121, No 3, 21 Jul 58, pp 411-414

Let there be given a table filled by collections of symbols of a certain alphabet. This may be either a dictionary, or a table of values of a function, or something else. The following problem arises here: to find in the given table the place in which a certain collection is entered. The problems of searching for a word in a dictionary and the finding of the value of a function according to the value of the argument reduce to this problem. There exists a trivial solution for the stated problem: to look through the collections of the table and to compare them consecutively with the given collection until a coincidence occurs. This algorithm is inefficient, that is, much time is required for its completion. This is justified for a one-time choice but extremely undesirable for repeated choices. In the latter case it is possible to indicate a more rational method of searching based on previous study of the given table. The time consumed on study of the table and compilation of the algorithm is completely warranted for repeated choices. We encounter an analogous process during the frequent utilization of a certain dictionary. We successively superimpose information concerning the distribution of words and as a result of this we accelerate the process of searching. This type of algorithm is extremely valuable for solution of problems on high-speed machines insofar as they increase their efficiency. In the present work a problem concerning selection from a table is exactly formulated, its solution for a certain class of tables is given, and it is indicated that it is close to the optimum.

80. Topological Characteristics of Dynamic Systems

"On the Question Concerning the Topological Determination of Integral Invariants," by Ye. A. Barbashin and V. A. Baydosov, Ural Polytechnic Institute imeni S. M. Kirov; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 3 (4), May/Jun 58, pp 8-12

An attempt is made to construct the topological determination of integral invariants in a dynamical system. An example was given in the form of a theorem showing application of the theory to the topological characteristics of dynamic systems.

VII. MEDICINE

Contagious Diseases

81. Rabies in East Germany

"On the Rabies Problem in East Germany," by G. Starke and Chr. Winkler, State Institute for Rabies Inoculation, Potsdam; Berlin, Das Deutsche Gesundheitswesen, No 32, 7 Aug 58, pp 990-994

In the postwar years Germany was hit by an epidemic of rabies, which even now cannot be considered completely under control. A statistical study of the occurrence of rabies in animals in East Germany shows a predominance in wild animals, especially in foxes (1,100 positive cases in 1956 and 1,118 in 1957, as compared with 120 dogs in 1956 and 196 in 1957). The number of persons requiring rabies shots increased from 3,666 in 1956 to 9,257 in 1957; to handle this increase, the number of inoculation stations had to be increased [from 15] to 18. In 1956, 103 liters of vaccine was obtained from 224 sheep and 150 rabbits; in 1956, 235 liters was obtained from 324 sheep and 125 rabbits. The rapid increase in the number of patients treated during 1956 and 1957 does not, however, directly reflect the course of the epidemic. Even thought rabies spread to new areas (for example, the Karl-Marx-Stadt area), one animal was often the cause for the inoculation of several persons. The concerted battle against the disease in wild animals also brought many people into contact with the carcasses, and since contact can represent a danger of infection, many inoculations of persons were ordered because of this contact. Five deaths from rabies were reported during 1956-1957.

Less than a year ago, the State Institute for Rabies Inoculation began the production of a serviceable hyperimmunization serum. At first, the serum was obtained from rabbits which were immunized intraperitonially in weekly intervals with a rabies vaccine. The sera are tested for immunization in the neutralization test. Pedal (Krause) infection is used rather than cerebral infection, because the former method is considered closer to natural processes. The same amount of virus (10 LD_{50}) is always used with serum dilutions for the test dosages. The titer of the immunization sera is thus characterized in each case by dilution beyond 50-percent effectiveness.

In the chemical purification (in which Dr Zimmermann of the Dessau Research Institute assisted), the intention has been to remove the albumins, since a final judgment has not yet been passed on the distribution of the immunization bodies in the globulin portion. In experiment, the chemically purified sera show very favorable results.

The therapeutic application of this hyperimmunization serum was possible only in one case, that of a boy who was bitten on 5 September 1956, but was not given the hyperimmunization serum until 83 days later, after the prodromal symptoms had already occurred. Since death did not occur until 19 December 1956, it is assumed that the hyperimmunization serum delayed the outbreak of the disease.

82. Heart Muscle Changes in Experimental Foot-and-Mouth Disease in Guinea Pigs

"Investigations of the Significance of the Changes of the Heart Muscle for Fatality From Foot-and-Mouth Disease in Guinea Pigs," by D. Schmidt and C. H. Becker, Friedrich Loeffler Institute, Riems; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 12, No 2, Mar/Apr 58, pp 336-347

After being infected with the virus of foot-and-mouth disease (type A_5), 42 guinea pigs were subjected to electrocardiographic examination at daily intervals. To make a histological examination of the heart, 21 animals were killed on the first and second day post infectionem, and one animal was killed on the fifth and one on the sixth day post infectionem. Between the third and the seventh days post infectionem, histological information was obtained from 19 animals which had died from the disease. Thirty-two percent of the animals examined on the first day post infectionem, and 90 percent of those examined on the second to the seventh day post infectionem showed changes in the electrocardiogram. The most frequently occurring deviation was the deformation of the T-blip, which was found in the case of 29 animals. PQ-elongation was found in only two animals, and QT-elongation in only 12 animals. QRS was deformed in the case of ten animals. Whereas atrioventricular transmission disturbances, ventricular extrasystoles, partial sinus block, dropping of the ST-interval, and tachycardia occurred only rarely, and then almost exclusively within the last 24 hours before death, one bradycardia -- except for one case in the same time span -- was found in 12 animals.

It is assumed that this bradycardia, in its first stage, is the result of virus-induced damage to the center of stimulation. Since, however, the hearts of seven animals examined by cardiograph during the time when death occurred continued to affect all reflexes after breathing ceased and death had occurred, and since all those changes were found in the electrocardiogram, which Spoerri saw in the electrocardiogram of healthy dying guinea pigs which had been administered an overdose of pernocton, the continuation of the frequency slowdown in the final stage of the disease must be also a result of the end of life processes. The appearance of additional serious disturbances in the electrocardiogram directly before death is scarcely to be explained solely through the tissue defects found in the histological examination; it is therefore assumed that they were established in the tissue changes, but did not actually appear until there was an impairment of the total metabolism during death. It thus seems justified to conclude that death of cattle from foot-and-mouth disease is not necessarily a result of heart damage, but can also occur as the result of the paralysis of vegetative centers through metabolic conditions.

Hematology

83. Chinese Develop and Test Plasma Substitute

"Preliminary Studies on the Use of Animal Serum as a Plasma Substitute," by Hua Fu-i (华福一) and others, Chinese Liberation Army Academy of Medical Sciences; Peiping, Chung-hua Wai-k'o Tsa-chih (Chinese Journal of Surgery), Vol 6, No 6, 1958, pp 624-638

This item presents the details of experiments undertaken to study intensively the properties of heterologous sera developed in 1954 by the Chinese People's Liberation Army Academy of Medical Sciences as potential blood extenders.

Animal sera were treated with formalin, sodium hydroxide, glucose, and heat. The resultant preparations were called "medical heterologous sera." Two batches were made: one from bovine serum and the other from

hog serum. The medical heterologous sera were opalescent, had osmotic pressures of about 90 millimeters H_2O and molecular weights of approximately 170,000. Neither produced hemolysis or hemagglutination in any of the four human blood groups.

In animal experiments, the sera produced no toxic effects in rabbits, mice, rats, dogs, and monkeys even in doses as great as 6 percent body weight and administered daily for 7 consecutive days. This is equivalent to giving a 60-kilogram man 3.6 liters daily for 7 days, the authors say.

It was also found that the medical heterologous sera were better than physiological saline in the prevention and treatment of experimental hemorrhagic shock. Moreover, when used in transfusions, it maintained an increased blood volume in normal experimental animals for as long as 2-8 hours. Fifty percent was eliminated from the blood stream 24 hours after transfusion and all of it had disappeared in 3-4 weeks, leaving no permanent accumulation in the organs.

Neither medical heterologous serum was pyrogenic to experimental animals. However, because of its antigenic property, it could be administered safely only in one single injection or in a series of injections within a week. Whether, in their present stage of development, they merit clinical trial should be carefully considered, the authors conclude.

Submitted for publication in May 1957, the article is well supported with tables, charts, and photographic plates.

Immunology and Therapeutics

84. Czechoslovak Treatment for Burns

"In Order [illegible] Burns Do Not Hurt So Much...," by Vojtech Bares, Prague, Ob[illegible]a Lidu, 10 Sep 58, p 1

When patients with second-degree burns are brought into Czechoslovak hospitals they are treated with an instrument which consists of three glass cannisters, a metal plated hose, and a spray gun. With this instrument a mixture of thrombin, antibiotic, blood plasma, and oxygen is sprayed on the burn, where it forms a thin, transparent film which makes bandages unnecessary and greatly reduces pain.

This instrument for treating second-degree surface burns was designed by Helm, MD; Petule, MD; and lab technician Wedel at the Surgical Department of the hospital in Klatov. The instrument was adopted for use on humans after 50 successful experiments were made with dogs.

When Soviet Engineer Babkin of the Institute of Experimental Surgery in Moscow visited the hospital in Klatov, he and other Soviet technicians tested it and decided not only to use it in the Soviet Union but also to manufacture it there.

A photograph of the instrument appears in source.

85. New Chemosera for Prophylaxis and Therapy of Infectious Diseases

Halle, Der Neue Weg, 12 Jun 58

With the development of the so-called "chemosera," the collective of experts at the Dessau Research Institute for Vaccines, headed by Dr Zimmerman, concluded its lengthy work in the field of research on immunity. The purpose of the new chemosera is the prevention and cure of infectious diseases. They are especially intended for use against streptococcic infections, such as pneumonia and sepsis, as well as for use in veterinary medicine against diseases occurring in young animals.

Pharmacology and Toxicology

86. Action of Certain Organophosphorus Compounds

"The Action of Certain Organophosphorous Compounds on Higher Nervous and Cholinesterase Activity," by Ye. I. Spynu, Khimiya i Primeneniya Fosfororgan. Soyedineniy (The Chemistry and Utilization of Organophosphorus Compounds), Academy of Medical Sciences USSR, 57, 336-341, discussion 341-343 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No19, 10 Oct 58, Abstract No 25527, by I. Mil'shteyn)

"The administration of 3 mg/kg of thiophos to cats lowers cholinesterase activity by 30-40% in 15-20 minutes; the activity returns to normal after 5-7 days. With the administration of 50 mg/kg of carbophos, cholinesterase activity is decreased by 45-50%."

Changes in higher nervous activity caused by thiophos and carbophos intoxication are expressed by an increase in active inhibition (differentiation and extinction) and a decrease in conditioned reflex of the narcotic type. The character of the changes in conditioned reflex activity is dependent on the affection of the higher nervous activity by the acetylcholine intoxication."

87. Toxicity of Certain Organophosphorus Insecticides Investigated

"The Dependence of the Toxicity of Certain Organophosphorus Insecticides on Their Chemical Structure," by Yu. S. Kagan (Kiev), Institute of Labor Hygiene and Occupational Diseases; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 5, Sep/Oct 58, pp 7-15

The purpose of the work was to analyze certain mechanisms discovered while investigating the dependence of toxicity on chemical structure among the esters of thio- and dithiophosphoric acid having the general formula $(RO)_2P<^{X}_{Y}$. The toxicity of 26 compounds, 16 of which were studied for the first time, was investigated. These compounds were synthesized by T. A. Mastryukovaya at the Institute of Elemento-Organic Compounds, Academy of Sciences USSR, under the leadership of M. I. Kabanchik, and at the Scientific Research Institute for Fertilizers and Insectofungicides by Mandel'baum and others under the leadership of N. N. Mel'nikov. The LD_{100} and LD_{50} of all compounds, as well as their maximum permissible dosage were investigated by a single internal administration to mice. The LD_{50} was calculated by interpolating integrated data. The animals were observed for 14 days after a single administration of the poison. For compounds having prospects for future practical application, i.e., characterized by being less toxic to warm blooded animals, additional toxicity tests were conducted by administering the poison through the respiratory tract and applying it to the skin, after which the cumulative and anticholinesterase properties were studied. Four tables containing the structural formula of the compounds, and the LD dosages are given.

The Institute of Labor Hygiene and Occupational Diseases, according to the author, has worked closely during the past few years in organophosphorus research with the Institute of Elemento-Organic Compounds, Academy of Sciences USSR, the Scientific Research Institutes of Fertilizers and Insectofungicides (NIUIF) and Plant Protection, the Nikitskiy Botanical Gardens, and many other scientific chemical and agricultural establishments.

88. Toxicological Properties of Heptachlorine

"Experimental Data Concerning the Toxicological Properties of the Insecticide, Heptachlorine," by V. I. Osetrov (Kiev), Institute of Labor Hygiene and Occupational Diseases; Moscow, Gigiyena Truda i Professionalnyye Zabolevaniya, No 5, Sep/Oct 58, pp 15-19

The aim of this work is to study the toxic properties of a domestic preparation, heptachlorine, following various methods of administration to warm-blooded animals.

As a result of the investigation the following conclusions were derived:

"1. Heptachlorine has the capacity of pervading the organism of warm-blooded animals through the alimentary canal, the skin, and mucous glands, as well as through the respiratory tract, and displays local irritating and resorptive action.

"2. Fatal concentration for a single inhalation of technical heptachlorine is markedly lower than a corresponding dose of DDT. A fatal dose of pure heptachlorine following a single administration to an animal organism through the gastrointestinal tract approximates the fatal dosage of DDT and hexachlorane. Heptachlorine is more toxic than DDT when applied to the unbroken skin.

"3. Heptachlorine possesses marked cumulative properties.

"4. The clinical picture, after the preparation has been administered to animals by various routes, has many similar traits which indicate principal affection of the nervous system, expressed at first by a state of excitation followed by the inhibition of its function. After repeated administration to the skin and repeated inhalation of the preparation, such symptoms of intoxication as general inhibition, adynamia, and atonia of the muscles usually predominate over any residual symptoms of intoxication.

"5. Basic macroscopic changes in dead animals indicate an affection of the internal organs, especially the liver, kidneys, and lungs.

"6. In utilizing a technical preparation of heptachlorine in agriculture, it is necessary to institute prophylactic measures to prevent intoxication, adhering closely to the sanitary regulations for working with chemical poisons."

89. Comparative Evaluation of Seven Soviet Glucosides

"A Comparative Evaluation of the Efficacy of Certain Domestic Glucosides," by T. S. Mnatsakanov, Faculty of Clinical Therapeutics, Yerevan Medical Institute; Moscow, Klinicheskaya Meditsina, 8 Aug 58, pp 130-138

A comparative evaluation was made of all data which have been collected for the last 8 years as a result of the clinical investigation of a series of new domestic cardiac glucosides used on patients suffering chronic blood circulation insufficiencies. The glucosides investigated included corglyconum, erysidum, erysiminum, adonisidum, kendosidum, and digipurenum. Strophantinum, a compound which has been thoroughly investigated, served as a basis for the therapeutic evaluation.

As a result of the investigation the following conclusions were drawn:

"1. Corglyconum, erysiminum, kendosidum, and erysidum are very active substances possessing all the basic properties of the strophantin type glucosides; however, digipurenum -- a member of the digitalis group -- differs in the character and degree of its effectiveness from digitalis and strophantin.

"2. The effectiveness of the compounds mentioned, during the treatment of patients suffering from blood circulation insufficiencies of I and IIA degree, are more or less the same. Their utilization during pronounced symptoms of decompensation (IIB and III degree) reveals the peculiarities inherent in each preparation.

"3. The most effective compound of the group mentioned is corglyconum, which, according to its hemodynamic properties, is equivalent to strophantin with this exception -- the action of strophantin is rapid and pronounced, whereas corglyconum displays its effect more slowly, giving, in the final analysis, results which equal those of strophantin. The scope of effective therapeutic action of corglyconum is markedly wider than that of strophantin. Corglyconum, according to its sedation properties, is not only equal to but in most cases surpasses strophantin. It is nontoxic and is well tolerated by patients (even with prolonged use).

"4. Erysiminum, kendosidum, and erysidum, according to their hemodynamic properties, were inferior to strophantin and corglyconum. They are effective to some degree in treating patients with mild

symptoms of blood circulation insufficiencies and are mildly effective against acute circulatory disruptions. Kendosidum acts more effectively than erysiminum and erysidum. Their sedative properties are not inferior to corglyconum.

"5. Digipuremum is a very active preparation. In the treatment of patients with acute symptoms of decompensation, it is more effective than erysiminum, kendosidum, and erysidum. It is similar to digitalis in its cumulative properties. Its prolonged use produces a series of toxic phenomena: sudden pulse drop, extrasystole arrhythmia, cardiac pain. This restricts the utilization of this preparation in the treatment of patients with coronary disturbances, arteriolosclerotic cardiosclerosis, and others.

"6. Adonisidum is slightly active and mildly effective after intravenous administration. In its action, it is inferior not only to strophantin and corglyconum but also to kendosidum, erysiminum, and erysidum; its toxicity (cumulative properties) exceeds that of these compounds and this fact prompted us to refrain from using it in clinical experiments.

"7. Prolonged use of these compounds in acute disturbances of cardiovascular activity can sometimes lead to addiction. In these cases it is recommended that combined therapy be used, i.e., exchange one preparation for another and then return to the original preparation, utilizing a so-called "chess" method of therapy.

"8. The therapeutic effectiveness of these preparations is markedly lowered when used on patients whose blood circulation insufficiency is connected with an active process (endocarditis, myocarditis). In these cases, it is necessary to introduce combined therapy with the appropriate glucoside in conjunction with sodium salicyate and antibiotics."

Pharmacology

90. Corglycone in Circulatory Insufficiency

"Experimental Use of Corglycone in Circulatory Insufficiency," by V. I. Pomerantsev, Tr. Krymsk. Med. In-t (Works of the Crimean Medical Institute), Vol 17, 1957, pp 266-270 (from Referativnyy Zhurnal -- Biologiya, No 7, 10 Apr 58, Abstract No 32899, by Ye. G.)

"Corglycone (I) is a preparation from the leaves of the lily of the valley. Sixty-seven patients with 2d and 3d degree circulatory disorders were under observation. Fifteen patients were treated with only (I);

the rest were given strophantin preparation and erysimin alternately. The treatment was continued for 24-38 days. A dose of 0.5-1.0 ml of a 0.06% solution of (I) was introduced intravenously 1-2 times a day in 20 ml of a 40% glucose solution. (I) was found to be more effective in patients with uncomplicated mitral defects of the heart. Secondary phenomena (bigeminy, bradycardia, nausea, vomiting, collaptoid condition) were observed in one third of the patients. The author noted a low therapeutic spectrum for (I) and a tendency to cumulation, especially against a background of preliminary strophantin therapy. (I) was well endured by the patients during decompensation, accompanied by disturbed coronary circulation. A comparison of (I) and erysimin showed a close similarity of their effectiveness with very slight toxicity of erysimin."

Public Health, Hygiene, and Sanitation

91. Committee for Sanitary Protection of Atmospheric Air Formed

"Khronika i Informatsiya" (unsigned article); Moscow, Gigiyena i Sanitariya, No 9, Sep 58, p 94

A Committee for the Sanitary Protection of Atmospheric Air has been established in the Main State Sanitary Inspectorate of the Ministry of Health USSR. Order No 220 of the Ministry of Health USSR dated 5 May 1958 confirmed the composition of the committee under the chairmanship of Prof V. A. Ryazanov, director of the Chair of Communal Hygiene of the Central Institute for the Advanced Training of Physicians; deputies, Candidate of Medical Sciences M. S. Gol'dberg, Institute of General and Communal Hygiene imeni A. N. Sysin, and Prof V. S. Serebrennikov, Sverdlovsk Medical Institute.

The basic assignment of the committee will be: to develop plans for scientific investigations concerning the sanitary protection of atmospheric air; to propose and evaluate regulations for decreasing the contamination of atmospheric air by industrial discharges and wastes; to investigate the effect of these wastes on the state of health and sanitary hygiene of the population; to develop concrete regulations concerning the formulation of new and the changing of established indexes of maximum permissible concentrations of harmful substances in atmospheric air; and to provide a consulting service for resolving problems connected with the sanitary protection of atmospheric air, etc. The committee will be based at the Institute of General and Communal Hygiene, Academy of Medical Sciences USSR.

92. Electrophotocolorimeter for Dust Determinations in Atmospheric Air

"The Determination of Dust in Atmospheric Air With the Aid of an Electrophotocolorimeter," by E. V. Rykhter and N. V. Shlygina, Permsk Oblast Sanitary Epidemiological Station; Moscow, Gigiyena i Sanitariya, No 9, Sep 58, pp 18-22

A new method for determining dust in atmospheric air is described. Air is aspirated through a liquid absorbent, a mixture of alcohol and glycerine in a 1:1 ratio at the rate of 20 liters per minute. The dust content is then determined by an electrophotocolorimeter which has considerable advantage over the time consuming, ordinary gravimetric method.

93. Review of Soviet Book on Air Pollution Control

Opredeleniye Vrednykh Veshchestv v Vozdukhe (Determination of Harmful Substances in Air), edited by O. D. Khalizovaya, Moscow, Medgiz, 57, 172 pp; (from Gigiyena Truda i Professional'nyye Zabolevaniya, No 5, Sep/Oct 58, pp 62-63, reviewed by Candidate of Chemical Sciences Ye. V. Gernet)

"This collected work fills the present gaps which exist in methods for determining new substances. Twenty-four projects which have been conducted during the past few years by workers at the Institute of Labor Hygiene and Occupational Diseases, Academy of Medical Sciences USSR, are reported.

"It is noted with great pleasure that up to date photometric, spectographic, chromatographic, polarographic, and luminescent measurements have been widely utilized in developing these methods. The timely development of a photoelectric analyzer for hydrogen arsenide determination by O. D. Khalizovaya and Ye. A. Batmanovskiy (pp 23-35), and the development of an analyzer for mercury vapor determination by these authors together with Ye. V. Deyanovaya and G. P. Maksimov should be acknowledged. Basically, both instruments utilize the reaction of the interaction of the substance to be tested with reactive paper followed by objective photometering of the color obtained. Close inspection will show that the electric circuits of both instruments are identical, and it is difficult to understand why the authors used different names.

The instruments are designed for continuous operation for a period of 24 hours and permit the determination of concentrations of hydrogen arsenide from 0.001 mg per liter and higher, and mercury vapor from 0.5 to 5 mg per cubic meter. Because of the low sensitivity for determining mercury, the instrument can only be used for monitoring high concentrations.

"Considerable interest is presented by new colorimetric reactions which permit the determination of a whole molecule of a substance. V. I. Kuznetsov reported some new colorimetric reactions used by some of the authors. Z. M. Pimenova (pp 117-128) developed a colorimetric method for determining one-, 2- dichlorethane in the presence of certain chlorinated hydrocarbons. The author collects the dichlorethane vapors on silica gel and then desorbs the dichlorethane in quinoline. The latter, upon heating, reacts with dichlorethane. The coloration obtained is compared with a standard colored solution scale. This method is comparatively simple and swift. It has been tested under industrial conditions and is considered completely reliable.

"The new colorimetric reaction of V. I. Kuznetsov for dimethylamine, utilizing an alcohol solution of furfurol in the presence of a weak alkali, permitted L. S. Chemodanovaya and G. S. Pavlovskaya (pp 155-157) to develop a method for determining dimethylamine in air, and permitted M. D. Babinaya and G. S. Pavlovskaya (pp 157-160) to determine dimethylformamide.

"F. D. Krivoruchko (pp 37-106) utilized the qualitative colorimetric reaction of Kreshkov and Bork for organosilicon monomers to develop a simple and swift method for determining the vapors of certain alkyl and arylchlorsilanes.

"Several methods for determining toxic aerosols are presented. M. S. Bykhovskaya and V. P. Kuz'mina (pp 43-50) developed a method for determining lead, permitting the determination of one microgram of Pb by polarography in the presence of significant quantities of iron and barium. S. I. Murav'yeva (pp 77-82) reported several methods for determining mono- and trivalent thallium compounds in air. Determinations of lead, barium, thallium, zinc, germanium, and beryllium are all conducted on the ISP-22 spectrograph. However, the sensitivity of the methods developed is significantly inferior to the latest data given by foreign authors (Fitzgerald J Arch. Industr. Health. 1957, V. 115, No 1 pp 68-73). In sampling 100 liters of air, the authors

determine 0.02 g of Be per cubic meter. M. S. Bykhovskaya and G. B. Bokova determined beryllium with a sensitivity of 0.3 micrograms. V. A. Shchirskaya (pp 82-89) investigated conditions for absorbing and colorimetrically determining ozone by a reaction with potassium iodine; in addition, she reported an original rapid method of determining ozone on paper saturated with orthotolidine. For determining fumes of peroxides in sanitary chemical investigations of water conduits, O. D. Khalizova and L. S. Chemodanova (pp 149-154) successfully utilized a colorimetric reaction for the formation of pertitanic acid.

"In utilizing a "Kartox" fumigant for determination of ethylene oxides in air, Z. M. Pimenova and Ye. G. Shapiro made use of a variation of a colorimetric method developed by S. S. Gurvits and T. I. Sergeyeveya based on the formation of ethylenechlorohydrin and its colorimetric determination with diazotized sulfanilic acid. The author suggests that sample collection be accomplished by an absorbing solution recommended by S. S. Gurvits and T. I. Sergeyevaya, instead of the normal absorbing equipment utilizing porous glass. This decreases the sampling time by 30%. Experimental data, confirming the quantitative sampling performed by the authors, should have been presented. The shortcomings of the method used for determining ethylene oxide are its low sensitivity (0.1 mg/liter) and nonspecificity in the presence of alcohols and aldehydes. Therefore, a very satisfactory method for determining ethylene oxides in "Kartox" is the method proposed by Ye. Sh. Gronsberg, which is based on the reduction of ethylene oxides in ethylene glycol and oxidation to formaldehyde, followed by colorimetric determinations. The sensitivity of the determination is 0.005 mg per liter. The method is specific in the presence of a significant number of components.

"V. I. Kuznetsov, Z. N. Pimenovaya, and A. P. Martynovaya (pp 164-168), on the basis of the colorimetric reaction of hexamethylenediamine with 2, 4 dinitrochlorobenzol, developed a very satisfactory and sensitive method for determining hexamethylenediamine. This method is more sensitive than the one developed earlier by Ya. Fertel'maystr, a nephelometric determination based on the reaction of hexamethylenediamine with bismuth salts in the presence of iodides.

"An interesting method was developed by M. D. Babinaya (pp 136-149). This is a colorimetric method for determining the new insecticide, chlorindane, based on a reaction with pipiredine dissolved in cellulose, or diethylene glycol with an alcohol solution of caustic sodium.

"Differential determination of benzol and its homologs is usually necessary in sanitary chemical investigations. L. S. Chernodanova, S. O. Khamaza, and M. M. Turkel'taub (pp 140-149) reported on differential determination of benzol, toluol and xylol by chromotographic methods. Small quantities of benzol and toluol are placed in the chromatographic column, and during the simultaneous action of a current of air and variable temperatures, benzol and toluol are desorbed at various intervals. The only thing said about kylol is that it is not desorbed under these experimental conditions. This method then can hardly be used for determining xylol. Consequently, the title of this work is inappropriate.

"The sensitivity of the determination for benzol is 0.05 mg, and for toluol 0.1 mg, which is certainly insufficient. The authors forgot the pressing problem concerning the technique of sampling in industry and the problems involved in placing the sample in the column. The described method is interesting; however, for practical utilization, the sensitivity of the instruments should be increased.

"The report of V. I. Kuznetsov and F. D. Krivonuchko (pp 113-117) described a colorimetric method for determining 2,4-tolulenediisocyanate based on the action a xylol solution with p-amino benzol in the presence of 80% acetic acid. The sensitivity of the reaction is 0.1 mg per 2 ml of xylol. The vapor tension of toluylenediisocyanate is very low, therefore, in any determination, it is necessary to sample a large quantity of air in which case this substance is very easily polymerized. As a result, a better method for determination in air is the method developed by A. Ya. Tubianaya, based on the formation of toluylenediamine and determined by a nitration reaction with alpha-naphthol. The reaction is 100% more sensitive.

"The collected work is insufficiently edited. There are a number of incorrect statements: For example, on page 5 it is indicated that hydrogen arsenide is found in industry as an admixture in metals, acids, polymetallic, and lead ores; on page 50 it is stated that the methods most widely used for the colorimetric determination of the hydrogen peroxide is the formation of rose tint following the addition of an acid solution of potassium permanganate to a solution of hydrogen peroxide. There are mistakes in calculating relative error in Tables 2 and 3 (p 34). There is no indication of what quantities the coordinates in Figure 4 represent (p 49). In the maltol method of determining streptomycin (p 132), the use of 0.84% solution of nitric acid is indicated, whereas an 84% solution should have been used. Errors in the determination of germanium in Table I (p 60) amounted to 400%, but it is subsequently stated in the text that the results were 'a little' higher.

"Although the collected work contains the above-mentioned shortcomings, the material presented is significantly important."

94. Method of Decancerogenizing Slate Chamber Resins

"The Use of Ultrasound and High-Frequency Currents for the Decancerogenization of Slate Chamber Resins," by Candidate of Medical Sciences O. L. Danetskaya, Leningrad Sanitary Hygiene Medical Institute; Moscow, Gigiyena i Sanitariya, No 9, Sep 58, pp 29-34

The purpose of this investigation was the prophylaxis of cancer which can result from exposure to high temperature slate products. Marked reduction in cancerogenic activity (by 95%) was observed after the resin was irradiated by ultrashort high-frequency waves; cancerogenic activity was reduced by 73% after the action of ultrasound waves (6000,000 cycles/sec).

95. Public Health in Rumania

"Progress in Public Health in Rumania," by Voynya Marinesku, Minister of Health and Social Welfare of Rumania; Moscow, Meditsinskiy Rabotnik, 26 Sep 58, p 1

"Considerable progress has been made in the Rumanian People's Republic in all branches of the national economy and cultural life. The Ministry of Health and Social Welfare has been successfully solving the problems which the Communist Party and the government have placed before it."

The rise in living standards of the population, improvement in sanitary conditions, and general well-being of the population are the principal factors responsible for a drop in morbidity and mortality rate in the country. Housing developments, covering almost 16 million square meters of land, have been made available for occupancy, between 1951 and 1956.

Comprehensive measures have been taken to control communicable diseases. The population has benefited greatly from free qualified medical service. A great upheaval has taken place in the training of physicians-specialists. There are more than twice as many physicians in the country now than there were in 1944. At present, there is one physician for every 800 people. A total of 122,000 beds are available

in hospitals and sanatoriums. Very important for the protection of the health of workers is that about 100 medical aid units with wards have been organized at industrial establishments; over 400 dispensaries of a specialized nature, and more than 1,000 medical stations are operating in industrial centers.

The Rumanian peasantry lived under conditions that were particularly difficult in the days when the bourgeois-feudal regime was in power. Medical assistance was practically unavailable to him. In the rural communities there was one physician for every 15,000-16,000 people. Every rayon at present has available at least one hospital with surgical, therapeutic, obstetric-gynecological wards, and wards for children. The rural medical districts now have outpatient clinics and dispensaries, maternity homes, and milk kitchens for children. All these medical establishments have both professional and semiprofessional medical personnel on duty at all times; they also have medical diagnostic equipment, drugs, and surgical dressings.

Much has been accomplished for the care and protection of mothers and children. The total bed capacity in hospitals for children in urban and rural areas of Rumania is 14,000. The number of nurseries and homes for children is increasing each year. Women receive maternity leave with pay for a period of 112 days during pregnancy and up to 30 days when they have to take care of an ailing child up to 2 years of age.

In the past, Rumania was first in incidence of tuberculosis, malaria, and endemic goiter. This is no longer the case. Many hospitals, dispensaries, and sanatoriums have been built to control tuberculosis; the newest methods of diagnosis and treatment are being used in these hospitals. Extensive preventive measures have been taken. Appreciable results have been noted. It is sufficient to say that mortality due to tuberculosis in 1956 was 78.6% below 1948. Incidence of malaria and typhus also dropped considerably.

The rise in cultural level and material well-being of the working population of Rumania and improved therapeutic and preventive medical service, for which the government allocates huge sums of money, has lowered mortality among children and the population as a whole by nearly half. Scientific research has increased in scope and many research projects have been inaugurated. More than 2,500 scientists are working on various projects in the following branches of medical science: phthisiology, oncology, microbiology, otolaryngology, ophthalmology, occupational hygiene, neurology, physiology, endocrinology, geriatrics, etc.

The government decided in 1958 to improve medical and sanitary service for the population and to change the salary structure of medical personnel. Appointments to positions in urban hospitals are now being made on a competitive basis and the salary paid to medical workers depends on the physician's qualifications and the position he holds. Arrangements like this permit the most rational distribution of medical specialists both in the rural and urban areas.

A new form of the organization of medical service consists in the establishment of medical districts, formed out of outpatient clincs and moved to residential areas so that they would be closer to the population they are to serve. Medical service rendered in the medical districts cover many fields of medicine. Only when a more accurate diagnosis is required are patients sent to an outpatient clinic for consultation with qualified specialists.

The wealth of experience which the health organizations of the USSR accumulated has helped the Rumanian medical workers in their efforts to improve the quality of their therapeutic and preventive medical assistance to the population.

96. Purity of Cysteine, Cysteine Sodium Cyanide Ratio, and Method of Administration Determine Degree of Chemical Protection From Ionizing Radiation

"Concerning the Chemical Protection of Animals From the Effect of Roentgen Rays," by V. G. Yakovlev and I. I. Ivanov; Moscow, Meditsinskaya Radiologiya, Vol 3, No 5, Sep/Oct 58, pp 14-20

The aim of this research was to study the radioprotective effect of L-cysteine and sodium cyanide in certain doses and combinations. Tests were conducted on mice, rats, rabbits, and dogs to which the various doses of radioprotective substances were administered before their irradiation with lethal X-ray doses.

The authors present diagrams illustrating the conditions for the irradiation of animals; data on mice and rats irradiated by various doses of X rays; the effect of the purity of L-cysteine on the viability of mice and rats irradiated by lethal doses of X rays; the effect of sodium cyanide on the viability of mice and rats irradiated by lethal doses of X rays; the protective effect of combining "pure" cysteine with sodium cyanide in experiments on mice and rats; the viability of rabbits irradiated without the protective measures; the viability of rabbits after an initial administration of "pure" cysteine and sodium cyanide; and finally, certain data on the protective effect of "pure" cysteine and sodium cyanide in experiments on dogs.

Minimum absolutely lethal doses used were 550-600 r and 600-700 r of X rays for mice and rats, respectively.

The authors make the following conclusions:

"1. The radioprotective effect of cysteine in vivo is in reverse ratio to its impurity content which catalyzes, the oxidation of this amino acid by molecular oxygen.

"2. In experiments on rodents it was shown that sodium cyanide increases the protective effect of cysteine. However, this increase depends on definite proportions of cysteine and sodium cyanide. Certain proportions may even aggravate radiation injuries.

"3. The parenteral administration of cysteine, and cysteine combined with sodium cyanide to dogs and rabbits produces a protective effect which is weaker than that produced in rats.

"4. Peroral administration of the above-mentioned substances to rabbits and to dogs showed no protective effect."

97. Changes in the Reactivity of White Rats After Clinical Recovery From Acute Radiation Sickness Discussed

"The Question of the Reactivity of White Rats After Clinical Recovery From Acute Radiation Sickness," by V. B. Rozen, Central Scientific Research Laboratory imeni S. I. Chechulin of the First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov (scientific leader, Prof S. M. Pavlenko); Moscow, Meditsinskaya Radiologiya, Vol 3, No 5, Sep/Oct 58, pp 3-7

The aim of this research was threefold:

1. To study the changes in the reactivity of an organism which clinically recovered from radiation sickness, in relation to repeated radiation effects, and also in relation to the action of certain nonradiation pathogenic factors, i.e., diphtheria toxin and morphine.

2. To explain the role of an initial dose of radiation of the direction of remote deviations in the reactivity arising in an organism.

3. To study the possible role of the hypophyseal-adrenal system in the development of changes noted in the reactivity of the experimental animals.

Tests were conducted on 410 white male rats of similar age and weight, which had been kept on standard diets and initially irradiated with 150 or 450 r X rays. The experimental animals which clinically recovered from the initial irradiation were classified into four major groups and irradiated with various doses 2 weeks after their clinical recovery. Results are as follows:

1. Single irradiation of rats by 150 r produced radiation sickness from which they recovered in 30-39 days. A second dose of 150 r two weeks after their recovery produced a milder form of radiation sickness. None of the animals died. A third dose of irradiation with 150 r produced a more serious form of radiation sickness in all animals, and was lethal in 47.5% of the cases.

2. A single irradiation of rats by 450 r produced radiation sickness which was lethal in 36% of the cases in about 11.4 days. The sickness lingered for 40-45 days. A second dose of 450 r two weeks after clinical recovery was lethal in 46.4% of the cases, and the animals which died showed more profound changes than the changes observed in the dead animals irradiated only once with 450 r. A third irradiation with 450 r produced the most severe form of radiation sickness, and was 100% lethal in about 9.2 days.

Still another group of experimental animals which were initially irradiated with 150 r were irradiated with 650 r two weeks after their clinical recovery. Lethal results were decreased by 25% and the average survival rate was 3.5 days longer than with the controls. However, if the initial irradiation was 450 r, then the second irradiation with 650 r, two weeks after recovery was 100 % lethal, and the life expectancy was 3 days shorter than that of the controls.

3. Animals initially irradiated with 150 r showed increased resistance to dyphtheria toxin, to morphine, and to the second dose of 150 r.

4. Changes in reactivity after having undergone the severe form of radiation sickness due to initial irradiation with 450 r had opposite effects, i.e., the resistance of the animals to repeated irradiation and nonirradiation action was decreased in the majority of cases.

The author states that the nature of these changes in the reactivity of an animal indicates the great significance of the compensation role played by the hypophyseal-adrenal cortical system in radiation sickness. The author concludes that this research proves that the initial increased activity of the hypophyseal-adrenal cortical system, and its subsequent exhaustion exerts a definite effect in changing the reactivity of the rat organism after its clinical recovery from radiation sickness.

98. Changes in Hemoglobin Due to X-Ray Irradiation

"Hemoglobin Changes Due to the Effect of Roentgen Irradiation," by M. A. Rozhdestvenskaya, in the collected work Aktual'nyye Voprosy Perelivaniya Krovi (Pressing Problems of Blood Transfusion), Vol 5, Leningrad, 1957, 81-85; (from Referativnyy Zhurnal -- Khimiya Biologicheskaya Khimiya, No 16, 25 Aug 58, Abstract No 21089, by N. Kazanskaya)

Methemoglobin was observed in the blood of irradiated animals. Methemoglobin appeared in dogs during the first week of radiation sickness, and during the second week of radiation sickness in the blood of rabbits. Increased resistance of hemoglobin to alkalies was noted in the blood of some of the animals that died after irradiation."

99. Filatov's Method Using Skin and Umbilical Cord Transplantations Stimulates Hemopoiesis in Radiation Leukopenia

"The Use of Tissue Transplantations in Radiation Leukopenia," by K. N. Chochia, Radio-Surgical Department of Central Scientific Research Roentgeno-Radiological Institute (director, Prof M. N. Pobedinskiy), Ministry of Health USSR; Moscow, Vestnik Rentgenologii i Radiologii, No 4, Jul/Aug 58, pp 79-80

"Much data from literature and from our own observations indicate that changes in peripheral blood due to radiation therapy of patients with malignant neoplasms, on the whole, lead to the development of leukopenia and lymphopenia, and that these sicknesses may attain such degrees that the question of stopping therapy often arises.

"For prophylactic purposes and for treating injuries of the hemopoietic organs, at present, use is made of blood transfusion, and transfusion of leukocyte mass (A. A. Bagdasarov, Ye. D. Dubovyy, A. V. Kozlova, and others).

"To stimulate leukopoiesis, use is made of the sodium salt of nucleic acid, pentoxyl, campolon, vitamin B Complex: thiamine, pyridoxine, vitamin B_{12}, folic acid, nicotinic acid, and vitamin C, and thesan (Ye. A. Vermel' and A. A. Sokolova, V. S. Vladimirova, M. A. Golubitskaya, R. N. Zundelevich, A. P. Lazareva, N. V. Lazarev, Haltern, Schorvon, and others).

We used tissue therapy to stimulate hemopoiesis. For this purpose skin and umbilical cord were used.

"Tissue transplantations were grafted onto patients with acute leukopenia and lymphopenia which had resulted from X-ray therapy and from radium therapy of patients with malignant neoplasms.

"The effect of transplantations on changes in the white blood were traced in 95 patients, 83 of whom received one tissue treatment; 10, two treatments; and 2, three treatments. Radiation therapy was not interrupted after tissue transplantation.

"After transplantation of preserved skin or umbilical cord (there was no special difference in their effect) the leukocyte count increased by 1,000 in 49 patients, by 1,500-2,000 in 15 patients, and leukocyte count returned to normal in 3 patients. Tissue transplantations had no effect on ten patients, and in 18 patients, the leukocyte count dropped.

"The number of leukocytes after tissue transplantation often rose as early as within 24 hours, while the number of lymphocytes either did not increase at all, or increased later.

"To demonstrate the effect of tissue transplantation due to radiation leukopenia, we will present a short summary of a patient's medical history.

"Observation No 1. Patient F.S.V., 55 years old, was admitted to the clinic on 11 April 1950, with a diagnosis of cancer of the upper right lung with metastasis in the lymph glands at the root of the lung.

"Blood picture upon admission was as follows: Hemoglobin 67%, erythrocyte count 4.2 million, and leukocytes 4,700 per mm^3 of blood, Leukocyte formula of blood was as follows: n. 5%, s. 58%, lymph. 27%, e. 2%, mon. 8%, and rate of erythrocyte sedimentation was 38 mm per hour.

"Roentgenotherapy was administered from 25 April to 20 July, from eight fields. Field dimension was 6 x 8 cm, skin-focal distance was 40 cm, a single dose was 250 r, and the total dose was 15,500 r.

"By 20 June leukocyte count had decreased from 4,700 to 4,200 per mm^3 of blood, and lymphocytes had dropped from 27 to 6%. Radiation therapy still continued.

"In view of the fact that leukocyte count decreased to 3,100 by 1 July, preserved umbilical cord tissues was grafted onto the patient, and by 17 July the leukocyte count rose to 4,450 per mm^3 of blood, and lymphocytes rose from 6 to 9%."

The following are the conclusions:

The author successfully used tissue transplantation according to the method of V. P. Filatov to stimulate hemopoiesis during radiation leukopenia.

"Tissue transplantations were used on a total of 95 patients in whom leukopenia had developed due to radiation therapy.

"Positive effect was obtained in 67 patients. After tissue transplantation, as a rule, therapy was not interrupted."

100. Two Sterilizers for Radioactive Preparations Manufactured

"Sterilizers for Radioactive Preparations" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 68, 26 Aug 58, p 4

"Through experimental work, the Central Institute of Roentgenology and Radiology has prepared several types of sterilizers for radioactive preparations.

"One of these instruments is designed for the sterilization of a colloidal solution of radioactive gold in standard glass ampules. This is a chrome-plated steel cylinder with a semispherical cap. At its bottom, it has an electric heater. To avoid contamination due to accidental breakage of an ampule, the latter is placed in an easily removable cylinder. The presence of such a cylinder impedes the flow of the current from the heater to the solution being sterilized. Therefore, the power of the heater is stepped up to 400 watts instead of the usual 200-250 watts. The heater works at 127 volts. Time necessary for sterilization is about 20 minutes. The sterilizer is completely shielded with a 1.5 cm thickness of lead, and it weighs about 20 kg.

"There is another sterilizer manufactured by another shop for sterilizing radioactive needles and preparations. This is a rectangular container with lead walls and a removable cap. The usual type of sterilizer is placed inside this container and in it the same process occurs. For heating the vessel from beneath, an electric heating element consisting of an iron coil with a 300-watt capacity and suitable voltage is mounted. This sterilizer, like the preceeding one, completely ensures the protection of medical personnel from ionizing radiation. Its weight is about 60 kg."

101. New Book on the Effect of Ionizing Radiations on Immunity

"Book Shelf" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 81, 10 Oct 58, p 4

The following book is advertised Vliyaniye Ioniziruyushchikh Izlucheniy Na Immunitet (The Effect of Ionizing Radiation on Immunity), by V. L. Troitskiy, and M. A. Tumanyan, Medgiz, 1958, 199 pages.

CPYRGHT

"This book consists of reports on the present status of the question of the effect of radioactive rays on microorganisms. A therapeutic method is described in which chemotherapeutic preparations are used to ward off infectious complications due to radiation sickness."

102. New Book on Chemical Protection From the Effect of Ionizing Radiation

"Book Shelf" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 81, 10 Oct 58, p 4

The following book is advertised: Khimicheskaya Zashchita ot Deystviya Ioniziruyushchey Radiatsii (Chemical Protection From the Effect of Ionizing Radiation), by Ye. F. Romantsev and A. V. Savich, Medgiz, 1958, 143 pages.

CPYRGHT

"This book consists of reports from non-Soviet literature, and deals with the physical, chemical, and biological processes which arise in the tissues of an organism subjected to the effect of ionizing radiation."

103. Yugoslavs Suffer Radiation Exposure

Helsinki, Hufvudstadsbladet, 18 Oct 58, p 15

This brief item states that six persons who worked on a reactor at the nuclear institute in Vinca near Belgrade have been exposed to a strong dose of radiation and adds that the cause is not yet known.

Surgery

104. Experimental Transplantation Surgery

Helsinki, Hufvudstadsbladet, 22 Oct 58

This item states that the Russian surgeon, Prof Vladimir Petrovich Demichov, will undertake new experiments in the transplantation of dogs' heads and hearts in East Berlin in November.

105. Regeneration of Organs by Grafting

Marseille, La Marseillaise, 30 Jun 58, p 10

This article states that the Institute of Experimental Biology USSR has succeeded in regenerating diseased pancreases and livers in monkeys by means of grafting.

Veterinary Medicine

106. Scientific Research in Veterinary Medicine for 1958

"Scientific Methodological Conference on the Discussion of the Plan for Scientific Research in Veterinary Medicine for 1958," by A. A. Petukhovskiy; Moscow, Veterinariya, No 3, Mar 58, pp 89 - 90

"To plan coordination of scientific research in veterinary medicine for 1958, the All-Union Academy of Agricultural Sciences imeni V. I. Lenin, Main Administration of Veterinary Medicine, and the Main Administration of Sciences, Ministry of Agriculture USSR, convoked in December 1957 a scientific methodological conference to discuss the planning of scientific research in veterinary medicine for 1958. The conference was attended by 246 persons. The keynote address was delivered by N. F. Rostovtsev, Active Member of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin.

"During the plenary session A. P. Boyko, chief of the Main Administration of Veterinary Sciences, spoke on the fundamental measures for controlling morbidity of farm animals and the aims of veterinary science. Ye. S. Arlov, Doctor of Veterinary Sciences, spoke on brucellosis among sheep and goats and measures for combating it. Prof P. A. Voloskov, spoke on trichomoniasis and vibrosis and measures for combating it. Prof A. V. Sinev spoke on diseases of farm animals in connection with the disturbances of metabolism and measures of prophylaxis. Prof V. S. Yershov spoke on the aims of scientific research establishments in the liquidation of mass helminthiasis among animals. Prof L. A. Faddeyev spoke on the results and aims of scientific research in the field of internal noncontagious diseases of farm animals. Prof N. M. Komarov spoke on the sanitation- zoohygienic norms in the construction of shelters for animals and fowl in kolkhozes and sovkhozes.

"The conference recommended that the following problems be worked out by the entire veterinary medicine network of the USSR: veterinary measures for improving reproduction and the raising of productivity of farm animals and fowl in kolkhozes and sovkhozes; measures for the liquidation of brucellosis among farm animals, anthrax in swine, and tuberculosis in cattle in the USSR; measures for the control of helminthiasis in farm animals; the study of metabolism in relationship to zoohygienic measures within the system of general prophylaxis; the investigation of antibiotics and chemotherapeutic methods for the prophylaxis and treatment of diseases and increasing production of animals; study of the physiology of microbes and the characteristics of viruses; and the search for a more modern method of immunizing animals.

"In addition to the investigation of the theme plans, sections of the conference also discussed proposals for improving scientific research. The following resolutions were accepted by the plenum of the conference:

"1. To concentrate in a single veterinary organ the leadership and control of the veterinary-sanitation service in the meat, milk, and other industries.

"2. To establish within the All-Union Experimental Institute of Veterinary Medicine a Division of Prophylaxis and Therapy of Internal Noncontagious Diseases; part of the participants of the section proposed that a clinical institute be organized.

"3. The Surgical Diseases Section proposed that a Central Veterinary Polyclinic where animals would be treated and scientific research be conducted be organized at the Moscow Veterinary Academy.

"4. To expedite the organization of the All-Union Institute of Physiology and Biochemistry of Farm Animals, and to have physiology and biochemistry laboratories in regional scientific research veterinary institutes.

"5. To require physiology laboratories and corresponding chairs of vuzes (higher educational institutions) to work out zoohygienic norms on animal shelters giving specific attention in 1958 to the study of heat liberation, moisture discharge, and gas exhalation by animals of various species.

"6. To conduct systematic seminars on the problem of construction zoohygiene in various oblasts of the country and also to conduct courses on the construction of agricultural buildings in chairs of zoohygiene of veterinary, zootechnical, and agricultural vuzes.

"The conference was concluded with a request that more funds be allocated to scientific research institutes, vuzes, and laboratories for further scientific research."

107. Foot-and-Mouth Disease in Reindeer

"Characteristics of Foot-and-Mouth Disease in Northern Reindeer, by I. M. Golosov and M. I. Klimontov, Byul. Nauchno-Tekhn. Inform. N.-I. In-t S. Kh. Krayn. Severa (Bulletin of Scientific-Technical Information, Scientific Research Institute of Agricultural of the Far North), No 3, 1957, pp 25-26 (from Referativnyy Zhurnal -- Biologiya, No 9, 10 May 58, Abstract No 40610, by L. S. Kirichenko)

"The characteristic salivation observed in cattle is not present in reindeer. Saliva accumulates in the form of foam in small quantities only in the corners of the mouth. At the onset of the disease, sluggishness and unwilling ingestion of fodder are noted in the animals. The mucous membrane of the oral cavity is hyperemic and painful, and primary aphthae on it are difficult to observe. Pronounced clinical symptoms appear after generalization of the disease. The body temperature is increased in the animals. Aphthae appear on the mucous membranes of the lips, gums, and edentate areas (the authors did not find aphthae on the mucous membranes of the tongue). Affection of the skin of the crown is also noted; shedding of the hoof keratin occurs as a rule. The skin in the hoof fissures is seldom affected. Foot-and-mouth affection of the extremities is frequently complicated by necrobacillosis. Abortions occur in diseased females. The animals recover after 10-15 days when the disease course is benign."

108. Hematological Investigation in Tularemia in Sheep

"Clinical-Hematological Investigation in Experimental Tularemia in Sheep," by A. A. Pogosyan, Tr. Arm. N.-I In-ta Zhivotnovodstva i Veterinarii (Works of the Armenian Scientific Research Institute of Animals Husbandry and Veterinary Medicine), Vol 1, 1956, pp 81-84 (from Referativnyy Zhurnal -- Biologiya, No 7, 10 Apr 58, Abstract No 31084, by I. Ya. Panchenko)

"Sheep were infected by subcutaneous introduction of an emulsion of a 48-hour Bacterium tularense culture in a dose of 1-5 billion microbial cells. The incubation period lasted 12-24 hours, after which the first disease symptom appeared--high body temperature (42°). Disappearance of the condition, general weakness of the animal, loss of appetite, hyperemia of the visible mucous membranes, increase in the regional lymph nodes, increase of frequency of pulse and respiration, and sometimes diarrhea and dry cough were noted clinically. Leukocytasis (neutrophilia and lymphocytosis) with a shift of the nucleus to the left was observed in the blood in the first days after infection. The number of erythrocytes and Hb was decreased somewhat at first and then readjusted to normal."

109. New Serological Test for Brucellosis

"The Colloid Complement Fixation Reaction (KKBR), a New Serological Reaction for the Diagnosis of Brucellosis" by A. Geissler, State Veterinary Medicine Testing Station; Leipzig, Monatshefte fuer Veterinaermedizin, Vol 13, No 19, 1 Oct 58, pp 586-590

A description is given of the new reaction, which is based on the ability of the high-molecular colloid, polyvinyl pyrrolidone (Kollidon) to unite with a "substance" in both the serum of the patient and in the complement, the latter being inactivated by this bonding. This "substance" has not yet been identified; pure serum albumin and serum globulin did not unite with the Kollidon used in the experiments.

In the reaction, an antibody of the first order is identified, which in all probability, is identical with the antibody detected in the indirect complement-fixation process. The new reaction (KKBR) is technically simpler than the indirect complement-fixation reaction, and is thus well suited for routine diagnostic tests. In inoculated and experimentally infected cattle, the KKBR, in general, did not become positive any later than the agglutination. It thus gives earlier and more positive results than the complement-fixation reaction in a salt medium.

This article describes the technical development of the reaction and attempts to explain the reaction processes.

110. Diagnosis of Brucellosis in Pigs

"The Diagnosis of Brucellosis in Pigs," by E. Hillebrand; Leipzig, Monatshefte fuer Veterinaermedizin, Vol 13, No 19, 1 Oct 58, pp 598-600

On the basis of foreign reports and the findings of tests conducted in three Bezirke of East Germany in September/November 1956, the author, in a speech delivered in March 1957, suggested the following outline for the diagnosis of brucellosis in pigs:

1. Anamnestic-epidemiological findings.

2. Clinical investigation of the herds. (These two points are not treated in detail, since they are considered the responsibility of the Kreis veterinarians [Dr Hillebrand addressing Bezirk veterinarians?].)

3. Serological blood tests, always on herds, never on the basis of individual animals.

a. Slow agglutination, with low, medium, and high titers, for example, from 1:5 to 1: 1,280. If the slow agglutination is negative, the blocking test should be used; if the latter also is negative, then the Brucella-Coombs test should be used.

b. Complement-fixation reaction: serum dosage 0.1 or 0.05, especially for chronic cases.

c. Sachweh reaction for detection of fresh infections.

4. It is advisable, indeed necessary, to identify the pathogen (a) Directly by means of solid nutrient media, aerobic cultures and by means of 10-percent CO_2 pressure; or (b) by animal experiments, i.e., with guinea pigs, with the simultaneous possibility of serological investigation.

5. Differentiation of the pathogen, necessary for epidemiological reasons:

a. Testing of the pathogen for its ability to produce hydrogen sulfide.

b. Testing of the growth retardation by various dyestuffs including Fuchsin, Thyonin, methyl violet, and pyronin. Wherever possible, S-forms of the original cultures [slant cultures] should be used exclusively.

6. An intracutaneous allergy test should be conducted as soon as the required Brucella-polysaccharid has been completely developed in East Germany. The Research Institute for Vaccines at Dessau has reportedly produced a Brucella-polysaccharid which produces unequivocal results in skin tests and has the effect of a haptene.

111. Diagnosis of Brucellosis Suis

"Experimental Investigations With Allergic Intracutaneous Tests for the Diagnosis of Brucellosis suis," by K. Dedie, Aulendorf/Wuettemberg Baden, Chr. Lehnert, Institute of Veterinary Hygiene and Animal Diseases, Karl Marx University, Leipzig, and H. Jendrusch, Research Institute for Vaccines, Dessau; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 12, No 2, Mar/Apr 58, pp 193-201

Two brucella allergens were tested in healthy and artificially infected pigs for their suitability for allergic intracutaneous tests for brucellosis suis. Both preparations produced unquestionable specific reactions in the case of infected animals. They affected only low-grade agglutinogen. The polysaccharide-polypeptide allergen (PP) can especially be recommended for practical research, since the suspected limiting titer of 1:20 (+ +) was never reached after this allergen was used.

112. Rabies in East Germany

"Rabies and Hygiene of Wild Game," by H. Ohder, director of Meiningen branch of Thuringian Office of Veterinary Research and Animal Health, Jena; Leipzig, Monatshefte fuer Veterinaermedizin, Vol 13, No 18, 15 Sep 58, pp 549-551

In the past few years, the forest area of Southern Thuringia has had a very good supply of game and also, unfortunately, a great amount of rabies distributed over the entire area. The carrier of the virus is (as in the rest of Thuringia) the fox, which represents almost 90 percent of the positive cases determined and which is responsible for most of the cases which occur in wild deer and domestic cattle. A ban on the shooting and consumption of deer is not possible at present, from an economic point of view, since about 2,000 roe deer and 200 red deer are eaten each year by humans in the area. For this reason, 2 years ago a district veterinary regulation was issued on the compulsory examination of all roe deer and red deer taken. The brain or head is sent to the inspection station, and released for consumption only after issuance of a negative report. During the past 15 months, 3,000 animals destined for human consumption were examined in this manner; in nine of these cases Negri bodies were determined. For this reason, 76 persons were inoculated against rabies.

Veterinary police measures alone have not been able to stamp out the disease. The voluntary cooperation of all hunters and foresters will be necessary to bring this about.

113. Meat Inspection in East Germany

"Can the Diagnosis of Meat Infected With Salmonella Bacteria Be Changed?" by H. Draeger, Laboratory of the Halle (Saale) Slaughterhouse; Leipzig, Monatshefte fuer Veterinaermedizin, Vol 13, No 18, 15 Sep 58, pp 560-564

The article states that "the diagnosis now valid for animal bodies infected with Salmonella bacteria must not be changed in any way," and gives the following arguments:

Now that the fact is generally accepted that Salmonella bacteria and their toxins are made harmless by heat, the demand is made on many sides that all animal carcasses in which Salmonella bacteria have been found be subjected to compulsory cooking and then sold over the counter. The technical and, above all, the hygienic requirements for treating such animals, however, are not available at all slaughterhouses and markets, so that the danger of infecting other animal carcasses is always present. It is even more dangerous when Salmonella are found in animal carcasses in forced-slaughtering and other establishments which have no cooking facilities. In such cases the dangerous animal carcasses would have to be transported over various distances, which would result in the contamination of vehicles, equipment, clothing, etc.

Miscellaneous

114. Seventh All-Union Congress of Roentgenologists to Meet in Saratov

"Seventh All-Union Congress of Roentgenologists" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 79, 3 Oct 58, p 3

The Seventh All-Union Congress of Roentgenologists and Radiologists met in Saratov from 20 to 25 October 1958. The congress heard reports concerning the hygenic requirements in the utilization of atomic energy for peaceful purposes, the utilization of ionized radiation in medicine, the problem of the harmlessness of X rays; occupational hazards in roentgenology and radiology and measures for their prevention, contemporary methods of radiation treatment of tumors, problems of X ray studies in clinics, and a series of organizational and methodological problems concerning roentgenology, florography, and radiology.

115. Problems of Medical Research in the Ukraine for 1959-1965

"Information on the Republic's Problem Plan for 1959-1965," by N. B. Man'kovskiy, Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 9, Sep 58, pp 57-62

The following 26 medical research problems are to be investigated during the years 1959-1965 in the Ukraine according to the Ministry of Health Ukrainian SSR: (1) basic laws of the workings of the higher divisions of the central nervous system and the normal and pathological coordination between the cortex and internal organs; (2) tuberculosis and its control; (3) etiology and pathogenesis of cancerous growths, complex treatments, and prophylaxis; (4) cardiovascular pathology (hypertension, arteriosclerosis, myocardial infarctions); (5) physiology and pathology of digestion; (6) rheumatism and its control; (7) diseases of the peripheral nervous system, their treatment and prohylaxis; (8) control of traumas and treatment of follow-up traumas; (9) goiter, its treatment and prophylaxis; (10) tissue therapy; (11) control of blindness and glaucoma; (12) hematology, blood transfusions, and blood substitutes; (13) physiological peculiarities of youth as a basis for the rearing of children and the prophylaxis of diseases; (14) etiology, pathogenesis, prophylaxis, and treatment of fundamental complications of pregnancy and parturition; (15) prophylaxis and treatment of pyorrhea alveolaris; (16) poliomyelitis; (17) acute children's infections; (18) dysentery and its control; (19) prophylaxis and treatment of influenza; (20) silicosis and its control; (21) labor hygiene in various branches of industry and agriculture; (22) hygiene norms and sanitation; (23) helminthiasis and its control; (24) medical radiology and radiation diseases; (25) infectious hepatitis; and (26) development of sanitoriums and rest resorts in the Ukrainian SSR.

116. Maj Gen Med Serv A. V. Mel'nikov, Soviet Surgeon, Dies

"In Memory of Aleksandr Vasil'yevich Mel'nikov" (unsigned article); Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 9, Sep 58, p 92

On 27 May 1958, Maj Gen Med Serv Aleksandr Vasil'yevich Mel'nikov, Active Member of Academy of Medical Sciences USSR, Honored Worker of Science, Chief, Chair of Faculty Surgery No 2 of the Military Medical Academy imeni S. M. Kirov, died at the age of 69.

Mel'nikov graduated from the Military Medical Academy in Petrograd in 1914 and received his degree of Doctor of Medical Sciences in 1920. In 1923 he was elected to head the Chair of Operative Surgery, Khar'kov Medical Institute and later the Chair of Surgical Pathology and Therapy, and for a number of years after 1932 he headed the Hospital Surgery Clinic. At the same time, from 1925 to 1935, he was a professor at the Khar'kov Stomatology Institute, first at the Chair of Operative Surgery and later at the Chair of Surgical Pathology. In 1940 Mel'nikov was elected chief of the Chair of Hospital and later Faculty Surgery of the Naval Medical Academy; and in 1956 he became chief of Chair of Faculty Surgery of No 2, Military Medical Academy imeni S. M. Kirov.

Mel'nikov is the author of over 120 scientific works, 12 of which are monographs concerning gunshot wounds and abdominal surgery. During his career some 45 persons received their candidate and doctor of medicine degrees under his supervision.

117. New Electrical Diagnostic Equipment

"Electrodiagnostic Apparatus" (unsigned article); Meditsinskiy Rabotnik, 7 Oct 58, No 80 (1724), p 1

The Medical Electric Equipment Plant in Moscow (EMA) has released the first series of electric pulse generators (EI-1) intended for use in diagnostic examinations of human neuromuscular systems.

This general-purpose apparatus makes it possible to conduct all types of electrodiagnostic examinations. The amplitude of the current pulse is regulated to stay within a range of from 0.5 up to 2,000 cycles per second, and, the duration of the pulse, from 0.02 up to 100 milliseconds. The galvanic and faradic excitability, chronaxy, and lability of living tissue can be determined with the aid of the electric pulse generator. An electric excitability curve of a patient can be rapidly obtained also by taking the reading on the tablet calibrated into pulses.

In contrast to electrodiagnostic apparatuses KED and ASM now manufactured, the EI-1 apparatus offers the possibility of obtaining results of examinations which are not dependent on such secondary factors as resistance of the skin, etc. This increases the accuracy of diagnosis.

The apparatus is supplied with a sound signaler that helps in keeping track of how it works. Assemblage of this apparatus consists of a collection of electrodes for conducting various examinations. The apparatus is supplied with power from a 127/220-volt network. It weighs 16 kilograms.

118. New Czechoslovak Cardiograph

"One Plus One Equals Two," by Vera Petrova, Prague, Zapisnik 58, 19 Sep 58, p 10

Special instruments determine the presence of electrical energy in unexpected places, for example, in the human body. Every bit of the human body is charged with a certain amount of electrical voltage. The activities of the heart give rise to "action potentials" which vary with the condition of the heart.

Academician V. Laufberger found a new and more perfect method of investigating the human heart by means of a so-called "spaciocardiograph" which gives a deeper and more detailed picture of the heart.

119. Hungarian Histologist Comments on Soviet Histology

"Hungarian Scientists Attend Discussion of the Lepeshinskaya Studies" (unsigned article); Budapest, Magyar Nemzet, 26 Sep 58, p 5

Prof Dr Ferenc Kiss, director of the Anatomy Institute of the Budapest Medical Sciences University, recently made a 6-week study tour in the Soviet Union. He has made the following statements concerning his experiences:

"This summer, I participated in the All-Union Congress of Soviet Anatomists and Histologists in Kiev.

"The Soviet scientists read outstanding papers, especially in the area of nervous system and lymph circulation studies. The five-man Hungarian delegation also read papers. Professor Krompecher of the Debrecen University reported on his research and Candidate Gyula Botar read a paper on his studies of the nervous system. My colleagues, instructor Laszlo Zselyonka and optical engineer Janos Barabas, introduced a plastic microscope illuminating device.

"I read a paper on the so-called biogranules (living cell particles) problem. My work in this area is connected with that of Olga Lepeshinskaya, the world famous Soviet scientist. Her recent studies have been severely criticized. On four different occasions on this trip, I had discussions with Lepeshinskaya, her colleagues, and her chief critics. On the basis of my own work, I voiced the opinion that about half of her concepts would have to be abandoned. Lepeshinskaya has come to the conclusion that a real cell could be created by the coming together of crystals from proteins. I consider this incorrect because new cells develop not from protein but from living granules (cell particles) in the material studied. In my opinion, Lepeshinskaya and her school must change their view according to which new cells arise from cell fragments; instead, they must observe the living particles which originate from appropriate cells. On the other hand, I introduced her critics to my original photographs; even if the first half of the Lepeshinskaya study is not proved on the basis of my research, still, the second more valuable half cannot be rejected.

"My position is intermediate between the two debating parties and the Academy of Medical Sciences USSR will have Lepeshinskaya, her critics, and myself present our new findings next year.

"I also visited scientific institutions in Kiev, Moscow, and Leningrad. On the basis of wide experience in the West, I can say that in no other country is anatomy and histology studied so systematically, profoundly, and successfully as in the Soviet Union. Research of the Soviet Academy is entirely independent of university work."

120. Soviet Medical and Technical Assistance to India

"Scientific-Technical Cooperation Between USSR and India" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 83, 17 Oct 58, p 1

A group of Soviet specialists in the medical industry, headed by A. G. Natradze of the Ministry of Health USSR, recently returned from an extended tour of India. They were invited by the Indian government to obtain assistance in the development of the Indian National Medical Industry.

The Soviet group, meeting with M. Shakh, Minister of Trade and Industry of the Indian Government, recommended the following concerning the development of medical industry in India: utilization of a credit of 80 million rubles to be loaned to the Indian government for the construction of a plant for the production of antibiotics, a plant for the production of synthetic drugs, a plant for the preparation of surgical instruments, a plant for the processing of medicinal plants, and a shop for the production of endocrine preparations. The Indian government is considering the recommendations of the Soviet group.

121. Interactions Between Titanium Chloride and Niobium and Tantalum Chlorides

"The Systems $TiCl_4$ - $NbCl_5$ and $TiCl_4$ - $TaCl_5$," by L. A. Nisel'son and G. L. Perekhrest, Moscow Institute of Nonferrous Metals and Gold imeni M. I. Kalinin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 9, Sep 58, pp 2150-2155

The melting point-composition diagrams of the systems $TiCl_4$ - $NbCl_5$ and $TiCl_4$ - $TaCl_5$ were investigated. It was established that these systems are close to ideal within a wide range of niobium and tantalum pentachloride concentrations (i. e., there are no interactions between the chlorides). By extrapolating the liquidus lines, the melting points of the pentachlorides of tantalum and niobium were determined and found to be 216.5° and 204.5°, respectively. These values are in complete agreement with the data reported by H. Schafer and Ch. Pietruck, Zeitschrift fuer Anorganische Chemie, Vol 267, 1951, p 174. On the basis of solubility data, the heats of fusion of $TaCl_5$ and $NbCl_5$ were determined and found to be 9.15 kilocalories per mol and 9.95 kilocalories per mol, respectively.

The question in the regard to interactions between the chlorides resulting in the formation of complex compounds is of importance, because the formation of such compounds would affect the completeness of separation in processes for the refining of the metals in question by the distillation of their chlorides.

122. Magnesium Alloys Containing Rare-Earth Metals

"The Constitutional Diagrams of Magnesium-Neodymium Alloys," by Ye. M. Savitskiy, V. F. Terekhova, and I. A. Novikova, Institute of Metallurgy imeni A. A. Beykov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 9, Sep 58, pp 2138-2142

By the methods of thermal analysis and investigation of microstructure and microhardness, a constitutional diagram of the system magnesium-neodymium up to 30% by weight of neodymium was constructed. This diagram was found to be of the eutectic type in the region investigated. A magnesium solid solution and a chemical compound of magnesium with neodymium apparently form the two components of the eutectic.

It was noted that when the content of neodymium is increased to 1% the structure of the alloys becomes noticeably smaller. It was established that addition of neodymium increases the hardness of magnesium and improves its tensile strength at room temperature or elevated temperatures. It is important to note that in the system magnesium-neodymium not only the mechanical strength, but also the ductility of the alloys increases within the region of the solid solution on the magnesium basis. This is explained by a special mechanism of the deformation of solid solutions based on metals with a hexagonal lattice.

By analogy with constitutional diagrams of magnesium-lanthanum, magnesium-cerium, magnesium-praseodymium, and magnesium-neodymium, and because of a similarity of the electronic structure and the physicochemical properties, one may assume that the constitutional diagram of alloys with other rare-earth metals of the cerium subgroup, viz., promethium and samarium, will have an analogous structure. Rare-earth metals are added to magnesium alloys in order to increase their heat resistance.

123. New Ultrasonic Solid-Liquid Alloying Process

"New Method of Preparing Metallic Alloys," by G. I. Pogodin-Alekseyev and V. V. Zaboleyev-Zotov; Moscow, Liteynoye Proizvodstvo, No 7, Jul 58, pp 25-26

A description is given of a new method of preparing alloys whereby the basic alloying component is added in dispersed solid form to the melt of the remaining portion of the alloy and uniformly dispersed throughout the melt by elastic sonic or ultrasonic waves or other methods.

Under laboratory conditions lead was melted and superheated to 400°C in a steel crucible by a tubular electric furnace placed over the crucible. Small portions of powdered (micron size) tungsten carbide were added to the melt while it was subjected to ultrasonic vibrations (frequency of 21.5 kc) from a magnetostriction transducer. Electrical oscillations were supplied to the transducer by a generator with a 3 kva rating. A special waveguide-concentrator welded on the transducer transmitted the ultrasonic vibrations to the crucible attached to but acoustically insulted from the end of the waveguide. Heat was removed after 10 minutes and ultrasonic vibrations cut off at the beginning of the solidifying stage. Micro examination of center and side portions of the ingot disclosed uniform distribution of the solid particles and a homogenous structure.

In a repeat experiment using a generator with a lower rating (0.15 kva) it was noted that a portion of the carbide powder had settled out but the remaining suspended particles were uniformly distributed.

Results of the lead alloy experiments proved that the proper intensity of ultrasonic vibrations will produce not only a uniform distribution of the solid particles and a uniform structure but also a decrease in the size of the solid particles.

An investigation of the zinc crystallization process using ultrasonic vibrations from a nickel radiator disclosed a uniform distribution of nickel particles (0.01-0.10 mm size) in the microstructure of the zinc and severe pitting of the submerged portion of the radiator. With different alloys welded to the end of the radiator it was possible to introduce these alloys into the melt in a quantity determined by the intensity and duration of radiation. Change of the frequency of radiation showed no substantial effect on the process.

Although the new method is not a complete substitute for case and powder methods, it shows definite advantages in a number of cases. Compared with powder methods, it requires less powder, eliminates the complex process of sintering and makes it possible to produce items of any configuration, dimension, and weight with a more uniform density and stronger binding of alloy components. Production of new alloys and improvement of existing ones will be possible with this method.

124. Hydraulic Extrusion

"Extrusion...Without Plungers," by V. Pospelov; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 10 Aug 58, p 4

A general description is given of the design and operation of an experimental plunger-free hydraulic extrusion machine designed by Engr M. Kurnevich and developed at the Laboratory of Hydraulic Presses of the Central Scientific Research Institute of Technology and Machine Building. A demonstration using aluminum billets was given by L. Gol'man, Candidate of Technical Sciences and director of the laboratory, with the assistance of D. Prokhronov and G. Timonin, co-workers at the laboratory.

A hydraulic compressor of a design developed at the Laboratory of the Physics of Superhigh Pressures, Academy of Sciences USSR, provided a gradual build-up of hydraulic pressure in the working fluid (in this case oil) surrounding the billet. At a certain pressure the billet was ejected through the die with a loud discharge. Pressure required in the aluminum billet demonstration was approximately 4,500 atmospheres. No information is given as to how billet flow is restrained until proper pressure is attained.

In this new method of hydraulic extrusion the billet material becomes plastic when the pressure of the working fluid reaches a certain level. The billet metal is forced through the die at speeds up to tens and even hundreds of meters per second. As the billet is separated from the sides of the extrusion container, friction of the type present in plunger-type presses is absent. Friction in the billet-die contact zone drops sharply after billet deformation is initiated due to formation of a thin fluid film (a so-called "hydrodynamic wedge") between the die and billet metal. This decrease of friction lowers the forces necessary for initiating extrusion and ensures uniform deformation of the billet. Several experiments were conducted with a preheated billet and container which further lowered the initial resistance to deformation.

From these hydraulic extrusion experiments the investigators came to the conclusion that extrusion is possible without high-pressure compressors. In this case only a relatively low (several hundred atmospheres) hygrostatic pressure is generated in the extrusion container. The extrusion process begins with the aid of a shock wave generated within the container by a powerful electrical discharge. An experimental model based on this principle has been tested at the Perovskiy Experimental Plant.

125. Rhenium in Electrical Contacts

"Rhenium as a Substitute for Tungsten in Contacts," by Prof V. V. Usov, Doctor of Technical Sciences, and Engr M. D. Povolotskaya; Moscow, Vestnik Elektro-Promyshlennosti, No 8, Aug 58, pp 1-4

Contacts made of rhenium, tungsten, and alloys of rhenium and tungsten were tested to determine the effect of humidity, high temperatures, and contact arcs on corrosion, erosion, and the formation of nonconducting films. Specimens of dense and porous rhenium and alloys of rhenium and tungsten were supplied by Prof Ye. M. Savitskiy, Doctor of Chemical Sciences, and M. A. Tulkina, Candidate of Technical Sciences, both at the Laboratory of Rare Metal Alloys of the Institute of Metallurgy, Academy of Sciences USSR.

As a contact material rhenium showed properties approximately equal to those of tungsten. The main advantages of rhenium are higher resistance to atmospheric and tropic corrosion and preservation of contact conductivity under the effect of high temperatures and contact arcs. Rhenium is easily impregnated with silver and copper and can serve as the basic component for contact compositions. Contacts made of rhenium and its alloys are easily soldered to copper, brass, and steel mountings. Mechanical cutting and polishing of contacts made of rhenium are performed by the technology applied in tungsten contacts.

Contacts of tungsten-rhenium alloys have properties ranging between those of rhenium and tungsten. It is suggested that rhenium and alloys with tungsten may be more suitable in special cases where tungsten contacts are frequently applied.

126. Zirconium Boride-Molybdenum Alloys

"Investigation of Zirconium Boride-Molybdenum Alloys," by M. S. Koval'chenko, V. S. Neshpor, and G. V. Samsonov; Kiev, Dopovidi Akademii Nauk Ukrains'koi RSR, No 7, pp 740-742

Investigations were conducted at the Institute of Powder Metallurgy and Special Alloys, Academy of Sciences Ukrainian RSR, on alloys of the ZrB_2-Mo system with ZrB_2 content ranging from 0.5 to 99.5% (molecular weight). Alloy specimens were prepared by sintering powder mixtures in alundum crucibles placed in carbon tubular furnaces in a hydrogen atmosphere at temperatures from 1,200°C.

Visual thermal, metallographic, X-ray, microhardness, and macrohardness tests revealed the formation of a third phase consisting of Mo_2ZrBr_2 beginning with ZrB_2 concentrations of 5%. Microhardness of the new phase was 2,500-2,683 kg/mm^2 as compared with 2,250 kg/mm^2 of the basic boride. A hypothetical phase diagram was constructed from the test results.

Investigations were also conducted on conditions for hot pressing of ZrB_2-Mo alloys containing 5, 40, and 60% Mo. Sufficiently compact alloys were obtained at pressure of 260 kg/cm^2 and temperatures of 2,000-2,100°C.

127. Local Heat-Treatment of Weld Joints

"Local Heat-Treatment of Joints Welded by the Electroslag Process," by V. N. Novikov and I. Ye. Tutov, Candidates of Technical Sciences, and Engr A. I. Kondrashev; Moscow, Metallovedeniye i Obrabotka Metallov, No 8, Aug 58, pp 38-43

Different types of heat-treatment were tested by the Central Scientific Research Institute of Technology and Machine Building and the Novo-Kramatorsk Heavy Machine Building Plant in experiments associated with the development of a technological process for electrothermal treatment of joints welded by the electroslag process. The specimens were unique plates of steel 22K (200 mm thick and weighing 100 tons) which had been butt welded along the median line with wire Sv-10G2.

Industrial current (frequency of 50 cycles) was used since this permitted a relatively low speed and high uniformity of heating. The width of the zone heated higher than the Ac_3 point was 2.5 times that of the welded joint. Heating beyond the limits of this zone occurred due to the thermal conductivity of the material. The induction apparatus for local heating of the welded joint consisted of a group of flat single-phase multiloop inductors connected into a three-phase circuit. Heating was accomplished simultaneously from both sides and along the entire length of the joint.

Results of the investigations proved that normalization improves the superheated coarse granular structure of the weld joint as obtained from the electroslag welding process and leads to increased ductility of the steel. After normalization and tempering, regardless of the heat-treating process, the metal of the weld joint and the adjacent zones shows mechanical properties equal to those in the base metal of the plate.

It was concluded that induction heating with industrial current is the most rational form of heating for normalization of metal in weld joint regions of large-scale plates. Localized electrothermal treatment of welded plates of steel 22K containing no less than 0.22% C produces weld joints with mechanical properties equal to those of the base material.

This new technology of local heat-treatment has been successfully perfected and introduced into industry. It is recommended for weld joints of tubing and steam pipes, high-pressure drums, columns of forge-press equipment and other components. This method may also be applied in cases requiring a more complete removal of residual stresses, since it prevents buckling of electroslag weldments during heating in high-temperature furnaces.

[For additional information on metallurgy, see Item No 23.]

Atomic and Molecular Physics

128. Thermal Equilibrium in Plasmas of Inert Gases Studied

"On the Nature of an Arc Discharge in an Atmosphere of Inert Gases," by V. N. Yegorov, V. N. Kolesnikov, and N. N. Sobolev, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 121, No 3, 21 Jul 58, pp 440-442

The question of whether a thermal equilibrium exists in an arc discharge plasma in an atmosphere of inert gases is examined. It is noted that many authors have taken a priori the existence of an equilibrium, while others have assumed equilibrium does not exist because of the low effective cross sections of the atoms of inert gases in comparison with the cross sections of atoms of metals for second order collisions with electrons.

The solution to the problem is approached by studying the distribution of the atoms participating in the discharge with respect to excitation level. It is claimed that in an equilibrium plasma this distribution will conform to the Boltzmann law

$$\log (N_o/g_o) - \log (N_i/g_i) = 5040 (E_1/T),$$

where N is the population of the level, g is its statistical weight, E is the excitation energy in electron-volts, and T is the equilibrium temperature of the plasma.

It is concluded from the measurements that in the discharge column between carbon electrodes under normal pressure and in an atmosphere of inert gases there is no thermal equilibrium. An explanation on the basis of low collision cross sections is termed inadequate. It is added that work is currently under way to study the possibility of approximating equilibrium by introducing atoms of metals into the discharge and slightly increasing the current strength.

129. Statistical Theory of Atom

"The Atomic Scattering Factor for X Rays and Electron Rays According to the Statistical Theory of the Atom," by T. Tietz, Institute of Theoretical Physics, University of Lodz (Poland); Leipzig, Annalen der Physik, Vol 2, No 1/2, Aug 58, pp 41-45

Formulas are derived for the intensity of the incoherent scattering of X rays and electron rays by a single neutral Thomas-Fermi atom, and the results are given in a table. The values obtained are in good agreement with the results of numerical calculations carried out by others.

130. Striation of Coupled Low-Pressure Discharge

"Observations on Coupled Low-Pressure Discharges in Argon," by K. Rademacher and K. Wojaczek, Institute of Radiation Sources, German Academy of Sciences in Berlin; Leipzig, Annalen der Physik, Vol 2, No 1/2, Aug 58, pp 57-67

Several coupled discharges were supported simultaneously with current intensities up to several amperes in crossed discharge tubes filled with pure argon at low pressure. Special attention was devoted to the question of the extent to which continuous striations can be suppressed in such discharges and to what degree anode or cathode disturbances can influence the otherwise unstriated positive column.

It is shown that the striation state of a long section of a positive DC column in argon is determined essentially by the total current flowing within this section of the discharge. In the case of a three-dimensional transition from an oscillating to an nonoscillating plasma, the cathode side of the column section always plays the dominant role, and the anode side the subordinate role. Somewhat above the limiting current density oscillations can be coupled into the adjacent positive column from the cathode side. This effect is being studied further.

131. Continuous Striations in Argon Column

"On Artificially Produced Continuous Striations in the Argon Low-Pressure Discharge," by K. Wojaczek, Institute of Radiation Sources, German Academy of Sciences in Berlin; Leipzig, Annalen der Physik, Vol 2, No 1/2, Aug 58, pp 68-80

Above the limiting current intensity i_G of Pupp (Physik. Z., 33, 844, 1932), periodic external interferences of matching frequency can excite artificially stationary, continuous striations in the positive column of a inert-gas low-pressure discharge. The striations extend from the anode

region to the point of excitation of the interference. The striation amplitudes exhibit an exponential rise or fall, depending on current and frequency. This behavior was investigated thoroughly for argon at a pressure of one Torr (mm Hg); the dependence of the dispersion and amplification of the artificial continuous striations on frequency was measured. The group velocity resulting from the dispersion of the case of the natural striation frequency agrees with the propagation velocity of the Pekarek (Vestnik MGU, Seriya Fiziko-matematicheskikh i yestestvennykh nauk, No 3, 1954, p 73) striation wave. With the aid of a formula derived by Pekarek (Czechosl. Journ. Phys, No 7, 1957, p 533), it is found that the natural striation frequency in certain ranges of the discharge parameters amounts to one fourth the collision frequency of the electron for ionizing collisions. The amplification in the vicinity of the natural striation frequency reaches a maximum which increases as the limiting current intensity is approached until the amplification finally becomes so great at ig that self-excitation is initiated.

132. Absorption Spectra of Sensitized Crystals at Low Temperatures

"On the Photochemical Behavior of Sensitized Silver Bromide and Silver Chloride Crystals Under X-Radiation," by E. Jeltsch, Institute for Crystal Physics, German Academy of Sciences, Berlin; Leipzig, Annalen der Physik, Vol 2, No 1/2, Aug 58, pp 1-12

This article offers supplementary information on the often reported behavior of pure and sensitized silver haloid crystals subjected to short-wave light radiation. Here, in place of visible light, X-radiation is used, which is very similar, both qualitatively and quantitatively, to the visible light. In both cases, pure crystals are very insensitive; a sensitization is possible, however, through the addition of small amounts (0.01-0.04 mol %) of Ag_2S, Ag_2Se, or Ag_2T (latter only in the case of AgBr crystals).

Irradiation at temperatures between minus 180 and minus 120 deg C (AgCl crystals) and between minus 170 and minus 140 deg C (AgBr crystals) produced a typical absorption spectrum, which depends in each case on the type of crystal and the type of sensitization. The positions of the long-wave main bands are characteristic. The photon energies of the band maxima can be represented approximately by $E = E_o + E_s$, whereby E_o is the energy term determined by the crystal, and E_s is the energy term determined by the sensitizer.

133. A 25-Mev Betatron

"A 25-Mev Betatron," by A. A. Vorb'yev and V. I. Gorbunov, Tomsk Polytechnic Institute, Izv. vyssh. uchebn, zavedeniy Fizika, 1957 No 1, pp 57-61 (from Referativnyy Zhurnal -- Fizika, No 9, Sep 58, Abstract No 19728)

An induction electron accelerator is described -- a betatron with a maximum radiation energy up to 25 Mev. The basic technical characteristics of the betatron and the peculiarities of construction of separate sections of the equipment are given.

134. Electron Accelerator

"Some Peculiarities of Electron Cyclic Accelerators to High Energy," by A. A. Kolomenskiy and A. N. Lebedev, Uskoriteli elementarnykh chastits (Accelerators of Elementary Particles), Moscow, 1957, pp 31-48 from Referativnyy Zhurnal -- Fizika, No 9, Sep 58, Abstract No 19732)

The effect of the electromagnetic radiation of electrons on the free and phase oscillations during the electron motion on curvilinear trajectories is analyzed. The motion of particles is considered as classical, but the effect of statistical quanta radiation fluctuations is taken under consideration. The behavior and the results of computation of free electron oscillations in accelerators with a periodic magnetic system are indicated, taking the radiation into account, as well as methods for damping of the oscillations. The effect of radiation fluctuations on free and phase oscillations is analyzed for this type of accelerators. In conclusion the separate action of accelerating intervals on the motion of electrons in accelerators is considered.

135. Improvement of Betatron Design

"Oscillationless Capture of Mechanism of Electrons Into Betatron Acceleration," by B. N. Rodimov, Tomsk Polytechnic Institute, Izv. vyssh. uchebn, zavedeniy, Fizika, 1957, No 1, pp 84-90 (from Referativnyy Zhurnal -- Fizika, No 9, Sep 58, Abstract No 19727)

The mechanism of the capture of electrons into the acceleration in an ordinary betatron has a low efficiency. Only an insignificant amount of all electrons which could be captured at the given focusing properties of the field is actually captured. An oscillation-free mechanism of electron

capture into acceleration is suggested in which the capture affects electrons of C = 0 only, but filling the whole well for C ≠ 0. This is achieved in that, before the injection starts, on the governing field, there is superimposed an additional field in such a way that the equilibrium orbit remains behind the gun. Thereafter the equilibrium orbit starts to lower itself to its normal position. The variation of the magnetic field and of the injection voltage is coordinated in such a manner with the variation of the radius of the equilibrium orbit that the potential well is filled only for C ≠ 0. The density of the injection current is kept such at each instant that no oscillatory motion occurs in the beams. This mechanism appears to be more effective than the usual.

136. Betatron Theory

"Relativistic Equation of Density of Charge in the Magnetic Field of a Betatron," by P. A. Cherdayev, Tomsk Polytechnic Institute, Izv. vyssh. uchebn, zavedeniy, Fizika, 1957, No 1, pp 77-83 (from Referativnyy Zhurnal -- Fizika, No 9, Sep 58, Abstract No 19726)

By making use of equations of electron motion and of Maxwellian equations for the external field and for fields created by the electron beam, the writer derived the equation of density of electron charge in a relativistic form. This equation makes possible computation of scattering and slowing down by the residual gas. The obtained equations are nonlinear and cannot be solved in a general way analytically. The solution of the density equation was obtained for densities approaching the equilibrium density. A method is given for solving the density equation with account of perturbation factors.

137. Improved Betatron Design

"A Betatron With Rectilinear Sections," by G. I. Dimov, Tomsk Polytechnic Institute, Izv. vyssh. uchebn. zavedeniy, Fizika, 1957, No 1, pp 62-71 (from Referativnyy Zhurnal -- Fizika, No 9, Sep 58, Abstract No 19724)

A betatron with rectilinear sections is analyzed. One of the rectilinear sections contains a ring-shaped electron gun of 100-200 kw power. The construction of such an electron gun does not involve difficulties while its application makes possible the acceleration of a relatively high amount of electrons during one betatron cycle. The motion of the electron equilibrium beam and the process of its formation are approximately analyzed.

138. Theory of Betatron Operation

"Experimental Fundamentals of the Theory of Particle Capture Into the Betatron Accelerating Process," by Yu. N. Lobanov, and V. A. Petukhov; Uskoriteli elementarn, chastits (Accelerators of Elementary Particles), Moscow, 1957, pp 73-82 (from Referativnyy Zhurnal -- Fizika, No 9, Sep 58, Abstract No 19723)

The 3-Mev betatron of the Second Scientific Research Physics Institute of Moscow State University was used for studying the relation of the efficiency of electron capture to various injection parameters. It was established that the maximum of intensity for an arbitrary injection energy E_{in} is attained, if at the instant of the injection the radiuses of the instantaneous orbits lie within the capture region located between the curves of the injection radius $R_{in}(E_{in},t)$ and the equilibrium orbit $R_o'(E_{in},t)$. During the studies of the effect of the injection current on the efficiency of capture it was found that the curve giving the relation of gamma-radiation intensity to the injection current I_{in} has a different behavior at low and at high currents, which points to the existence of two capture mechanisms, different in efficiency. At low currents where the gamma output is proportional to I_{in}, electron capture occurs related to a slow contraction of instantaneous orbits and to a damping of radial oscillations at an increasing magnetic field; at high currents where gamma $\sim I^4_{in}$, probably an interaction occurs between the electrons and the electric magnetic fields created by them. Tests were carried out at various values of injection parameters and frequencies for determining the magnitude of contraction of instantaneous orbits which affect capture efficiency. At injection currents equal or exceeding the optimal value the magnitude of contraction of instantaneous orbits during several turns exceeds 4 mm. At low injection currents the contraction of orbits is insignificant. It was established that at injection currents close to optimal the space charge does not affect the operation of the accelerator.

139. Gamma-Spectrometer

"Luminescence Gamma-Spectrometer Using a Photoelectron Multiplier of the FEU-19 Type and a CsI (Tl) Crystal," by O.I. Sumbayev and A. A. Konstantinov, Tr. Vses. n.-i. in-ta metrol., 1957, No 30 (90), pp 117-131 (from Referativnyy Zhurnal -- Fizika, No 9, Sep 58, Abstract No 19750)

Methods are described by which spectrometric properties of photomultipliers FEU-19 were investigated, as well as many characteristics of the spectrometer (resolution in energy and linearity) with CsI(Tl) and NaI(Tl) crystals. To select the photomultipliers suitable for spectrometry and for determining the optimal distribution of potentials on the focusing system

of the photomultiplier, standard light flashes from Kerr cells were used. The optimal distribution found showed improvement of the resolution of the photomultiplier by a factor of 2 in comparison with the resolution corresponding to uniform distribution of potentials on dynodes. The linearity and the resolution of the spectrometer were checked on isotope spectra of Zn-65(1.12 Mev), Co-60 (1.17 and 1.33 Mev); Na-24(2.76 Mev); and In-114. The resolution of the spectrometer with a CsI(Tl) crystal 27 mm in diameter and 12 mm thick for the line 1.12 Mev was 11%; with a NaI(Tl) crystal of the same dimensions the resolution was 9.5%.

140. Linear Accelerator Research

"Experimental Study of a Section of a Linear Accelerator With a Phase Velocity Equal to the Speed of Light," by A. V. Shal'hov, Nekotoryye vopr. inzh. fiz. (Some Problems in Engineering Physics), No 1, Moscow, 1957, pp 58-61 (from Referativnyy Zhurnal -- Fizika, No 9, Sep 58, Abstract No 19720)

A diaphragmed waveguide was used in the studied accelerator section. The waveguide was designed to receive an increase of electron energy of $\Delta E = 3$ Mev on one meter length at an input power of one Mw. The electrons entered the waveguide after preliminary acceleration up to about 2.5 Mev. The following graphs were plotted: $\Delta E(f)$, $\Delta E(\varphi_0)$ and $\Delta E(P_{in})$, where f is the frequency of the source of ultrahigh-frequency power, φ - the phase of an electron beam bunch at the input into the section, and P_{in} the high-frequency power at the same input. The two first curves look as has been theoretically anticipated, but in the absolute value of ΔE the curves are about 20% lower than the computed ones. The third graph shows that $\Delta E \sim \text{const.} \sqrt{P_{in}}$.

141. Study of Wide Cosmic Showers

"Ionization Chambers and Equipment for Studying Wide Atmospheric Showers of Cosmic Rays," by I. M. Bekkerman, V. A. Dmitriev, L. P. Molchanov, G. B. Khristiansen, and P. I. Yarygin, Plant "Fizpribor"; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 58 pp 31-36

Pulse ionization chambers are described, as well as their attachments such as preamplifier and amplitude analyzer. The construction and execution of these chambers ensure long service life without change of filling. The equipment permits the recording of pulses whose amplitudes differ by an order of 4, where the minimal pulse corresponds to the passage of one relativistic particle. The equipment was executed by the plant "Fizpribor" and has been operating without failure for 2 years at the cosmic ray laboratory of Moscow State University.

142. Improvement of Accuracy of Cyclotron Beams

"Precision Monitor for a Cyclotron," by V. N. Dobrikov, N. I. Zayka, and O.F. Nemets, Physics Institute, Academy of Sciences Ukrainian SSR; Moscow, Pribory i Tekhnika Eksperimenta No 4, Jul-Aug 58, pp 23-25

A monitor is devised permitting the integration of currents of the extracted cyclotron beam with an accuracy of 0.1% at a current strength of 10^{-9} amp and above. The monitor consists of an integrating ionization chamber set on the path of the beam and of a current integrator made up of a two-stage series-connected balanced amplifier, the output of which controls a relay circuit. The device is based on the work by G. M. Boricius and F. C. Shoemaker (Rev. Scient. Instrum., 22, 3, 1951) and adjusted to domestic tubes. The harmful effect of leaks is neutralized by using an integrating ionization chamber "amplifying" the current of the beam in the role of a transmitter.

143. Measurements of Magnetic Fields in Accelerators

"Application of Permalloy Transmitter for Measuring Magnetism in Accelerators," by K. N. Shorin, Yu. N. Metal'nikov, G. M. Bozin, and L. V. Yeremin, Physics Institute of the Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 58, pp 25-29

A magnetometer with a permalloy transmitter for measuring stationary and dynamic magnetic fields in accelerators in the range of 0 to 60 oersted is described. Some usual errors in the case of heterogeneous fields, due to the hysteresis of the permalloy, are eliminated in this device. A method for measuring distortions of the mean magnetic plane in synchrotrons is also suggested.

144. Computing Analogs for Reactors

"Electric Modeling of Nuclear Reactors," by V. V. Korolev and I. I. Sidorova; Moscow, Atomnaya Energiya, Vol 5, No 1, Jul 58, pp 29-44

A review of recent achievements, mostly American, in the electronic modeling of nuclear reactors is presented. The advantages and disadvantages of modeling are analyzed. USSR industry manufactures the series-produced MN-7, a machine for modeling equations of the isotope composition of a reactor, and a larger model MN-8 for solving systems of equations of higher order. It is expected that the introduction of these modeling devices will permit full automatization of atomic power stations and will imply new control and regulation systems.

145. Experimental Nuclear Reactor VVR-S

"Test of Mock-Up of the Experimental Nuclear Reactor VVR-S" by N. A. Lazukov, I. Ye. Chelnokov, and V. P. Ivanov; Moscow, Atomnaya Energiya, Vol 5, No 1, Jul 58, pp 44-51

The results of tests on a mock-up of the VVR-S reactor are presented. The neutron-physical parameters for the start-up operation, and exploitation were studied. The critical mass, the maximum operational charge, the compensating power of control and safety rods were found as well as the influence of various factors on the reactivity. The vertical and radical distribution of neutron flux in the core and the lifetime of fuel rods were measured.

146. Nuclear Calorimeter

"Isothermal Calorimeter for Measuring the Activity of Beta-Emitters," by All-Union Scientific Research Institute of Metrology imeni Ye. A. Kol'nova, Mendeleyev, Leningrad, Tr. Vses. n.-i. in-ta metrol. 1957, No 30 (90) pp 18-24 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 22202)

A calorimetric apparatus was devised for measuring the beta-activity of preparations. It consisted of three coaxial Dewar flasks filled with liquid nitrogen. The external and the intermediate vessels served as thermostats for the internal vessel, which carries the measuring device. The heat produced on absorption of beta particles, emitted by the preparation is spent on the evaporation of the liquid nitrogen. The volume of the gaseous nitrogen, measured by means of a calibrated capillary at 760 mm Hg and 20° C, makes it possible to establish the activity of the compound. The sensitivity of the calorimeter, found by means of calibration with the aid of a heating coil, equals 4.25 cm^3/sec .watt and permits measurement of activities above 10 microcurie (at $\overline{E}$ = 1 Mev).

147. Measurement of Weak Radioactivity

"Measurement of Compounds of Weak Activity," by F. M. Karavayev, All-Union Scientific Research Institute of Metrology imeni Mendeleyev, Leningrad, Tr. Vses. n.-i. in-ta metrol., 1957, No 30 (90), pp 53-60 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 22203)

Equipment for measuring radium gamma equivalents of radioactive preparations in the range of 0.001 - microequivalent of Ra is described. The equipment consists of a ionization chamber connected to a dc amplifying electrometric tube. For measuring the ionization currents a compensation method was used: the voltage drop at the input resistor ($\sim 10^{11}$ ohm)

is compensated by a potential of opposite sign, read by the potentiometer. The measuring method was tested and the sources of errors were analyzed. Means of avoiding errors are indicated. The sensitivity of the equipment was established, as well as the accuracy of measurements.

148. Measurements of Half-Lives

"Accurate Measurements of Half-Lives," by F. M. Karavayev and S. A. Rusinova, All-Union Institute of Metrology imeni Mendeleyev, Leningrad, Tr. Vses. n.-i, in-ta metrol., 1957, No 30 (90) pp 132-142 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 22204)

The half-lives of a number of isotopes were measured by the method of successive measurements of the radium gamma-equivalent of the studied preparation, using equipment consisting of a ionization chamber, and also by the differential chamber method. The differential chamber is described. The method applied is evaluated and the accuracy of results obtained by both methods is compared. The measurements resulted in the following values for the half-lives : Na-24 = 14.98 $\pm$ 0.02 hours, Cr-51 = 27.85 $\pm$ 0.02 days and 28.04 $\pm$ 0.16 days, Zn-65 = 244.6 $\pm$ 0.6 days, Ag-110 = 250.8 $\pm$ 0.3 days. The results obtained were found to be in good agreement (except Ag-110) with the most accurate data reported by other investigators.

149. Standards of Gamma Equivalents

"Test of Standardizing Equipment for Measuring the Gamma-Equivalents of Radioactive Compounds," by K. K. Aglintsev and F. M. Karavayev, All-Union Scientific Research Institute of Metrology imeni Mendeleyev, Leningrad, Tr. Vses. n.-i. in-ta metrol., 1957, No 30 (90), pp 37-52 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 22205)

A method for accurate measurements of the radium gamma-equivalents of radioactive preparations was tested on standard VNIIM equipment in the range of 1-1,000 microgram-equivalents of Ra. The equipment consists of an ionization chamber connected to a compensating electrometric circuit with a quadrant electrometer as a zero indicator. The sources of systematic errors are analyzed and methods of eliminating errors indicated. The optimal measuring conditions were established which secure the highest accuracy of measurement results.

150. Dependence of Gamma Equivalents on Filtration of Radiation

"Study of Dependence of Gamma-Equivalents of Radioactive Isotopes on Filtration of Radiation," by F. M. Karavayev, All-Union Scientific Research Institute of Metrology imeni Mendeleyev, Tr. Vses. n.-i. in-ta metrol., 1957, No 30 (90), pp 61-69 (from Referativnyy Zhurnal -- Fizika No 10, Oct 58, Abstract No 22206)

The dependence of the magnitude of radium gamma-equivalents of Cr-51 Co-60, Zn-65, Zr-95, Ag-110 and Sb-124 on filtration through lead was studied under two different geometric conditions (a narrow and a wide beam of gamma rays.) The dependence was established experimentally, and theoretically. The measured and computed results of gamma-equivalents for the narrow and the wide beams are in satisfactory agreement within the limits of accuracy of measurement and computation.

151. Gamma Neutron Reactions

"Threshold Energies of (gamma, n) Reactions," by A. K. Berzin, Tomsk Polytechnic Institute, Izv. Tomskogo politekhn. in-ta, 1957, 87, pp 431-432 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 22371)

The threshold energies of reactions (gamma, n) for the rare earth isotopes Pr-141, Nd-150 and Gd-160 were measured by the method of direct recording of neutrons, which formed in the reactions as related to the maximum energy of the Bremsstrahlung. A 25-Mev betatron was used. For excluding neutrons outside the sample, a special shielding was used. The obtained threshold values of (gamma, n) reactions for Pr-141, Nd-150, and Gd-160 were found to be 9.6 $\pm$ 0.4, 7.2 $\pm$ 0.4 and 7.6 $\pm$ 0.4 Mev respectively.

152. Resonance Generator Produces Continuous Signal

"Nuclear Resonance Generator Operating in the Earth's Magnetic Field," by F. I. Skripov, Scientific Research Physics Institute, Leningrad State University imeni A. A. Zhdanov; Moscow, Doklady Akademii Nauk SSSR, Vol 121, No 6, 21 Aug 58, pp 998-1000

The method proposed by Packard and Varian (Phys Rev, 93, 941, 1954) for measuring magnetism by studying nuclear precession in the earth's magnetic field is criticised on the grounds that the damped character of the signal which is observed for no longer than several seconds not only produces a discontinuity in the observations and prolongs the time necessary to obtain each reading but also limits the accuracy of measurements of precession frequency and field strength.

The design and construction of a nuclear resonance generator which gives continuous readings are described. There is continuous replacement of the sample material in the receiver coil. The precession vector of the sample material is given an inclination of 90 degrees to the earth's field before entering the coil.

Tests with flowing water as a sample were termed satisfactory. Three photographs of the resulting signal are given.

153. Formation of Pseudotridents Considered in Pair Production Cross Section

"Calculation of Pseudotrident Processes in Evaluating Cross Section for Indirect Electron-Positron Pair Production by Electrons," by V. A. Tumanyan, V. A. Zharkov, and G. S. Stolyarova; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 2, 11 Sep 58, pp 208-210

The Monte Carlo Method is used to calculate the number of pseudotridents in a given electron track length. The calculation is in connection with determining the cross section for indirect electron-positron pair production by high-energy electrons. The pseudotridents, it is noted, are formed in the conversion of gamma quanta from electron bremsstrahlung immediately adjacent to the track of the electron, so it is therefore impossible to distinguish the tracks of an electron and the pair formed by gamma quanta from those indicating the indirect formation of an electron positron pair by an electron.

A table and graphs of the results are given. Considerable discrepancies with other authors are found in the resulting cross sections for indirect pair production after taking into account the calculated number of pseudotridents.

154. Scattering Coefficient in Thomas-Fermi Model

"The Coherent Scattering Coefficient in the Thomas-Fermi Model," by L. Kolodziejczyk, Institute of Theoretical Physics, University of Lodz (Poland); Leipzig, Annalen der Physik, Vol 2, No 1/2, Aug 58, pp 54-56

The article presents a calculation of the scattering coefficient with the aid of the Rozental approximation (Z. Physik 98, 742, 1935) of the Thomas-Fermi function for free neutral atoms.

155. Neutrino Properties of Dirac Particles with Oriented Spin

"On the Theory of Dirac Particles With Oriented Spin," by A. Sokolov and B. Kerimov, Physics Faculty, Moscow State University; Leipzig, Annalen der Physik, Vol 2, No 1/2, Aug 58, pp 46-53

It is shown that phenomena which are connected with the nonconservation of parity in weak interactions can be investigated with the help of Dirac equations, assuming spin orientation. The influence of the spin orientation, in the case of the electron and the neutrino, on the beta-decay and the decay of pi-mesons is discussed. According to the theory of the neutrino with oriented spin, when an antineutrino with oriented spin is emitted during beta-decay of the nonoriented nuclei, a polarization of the electrons in the direction of motion must be observed. An expression is given for the polarization of the mu-meson when the neutrino is completely polarized during pi-meson decay; on the basis of this expression, it is possible to avoid combinations of variables and pseudovalues in the application of the theory of the neutrino with oriented spin to a treatment of interaction energies. It is also shown that, with the aid of the theory of the Dirac particles with oriented spin, it is possible to describe in two ways or both the properties of the neutrino and those of the antineutrino. Identical results are obtained only when the mass at rest is lacking, and these identical results have been used as a basis for the proof of combined invariance. If the mass at rest is different from zero, states 1 and 2 lead to different results for the neutrino (or antineutrino); thus four different states are obtained for this condition, and each of these states shows, in itself no combined invariance.

In spite of the simultaneous presence of particles (electrons, protons, neutrons, etc.) and antiparticles (positrons, antiprotons, antineutrons, etc.), our world is clearly asymmetrical with respect to the number of particles and antiparticles. It is quite possible that the asymmetry in our world is a direct expression of the nonconservation of parity. If this is actually the case, then the asymmetry which is connected with parity must be directly the reverse in the "antiworld."

156. Catalysis of Nuclear Fusion by Mesons

"At General Conferences of the Departments" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, Vol 28, No 8, Aug 58, pp 57-68

In Item No 105, Scientific Information Report, PB 131891T-9, published under the above title, a statement from the original Russian text was rendered as:

"The reaction of the synthesis of hydrogen nuclei could take place in cold matter at measurable velocities by tunneling if the actual distances between nuclei were by tens of times greater than the mean distances."

The statement should read:

"The reaction of synthesis of hydrogen nuclei could take place in cold matter at measurable velocities by tunneling if the mean distances between nuclei were of the order of a fraction of one tenth of the actual distances observed."

[For additional information on nuclear physics, [see Item No 27.]

Theoretical Physics

157. A Particular Problem of Thermodynamics

"Propagation of a Nonautomodel Thermal Wave," by E. I. Andriankin, Institute of Chemical Physics, Academy of Sciences USSR; Moscow Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 2 (8), Aug 58, pp 428-432

A problem previously analyzed by Ya. B. Zel'dovich and A. S. Kompaneyets (Sb. posvyashchennyy 70- letiyu A. F. Ioffe [Collection of Articles Celebrating the 70-th Anniversary of A. F. Ioffe], 1950) is further developed. It concerned heat emitted at an instant from a point source in a medium of constant density and with coefficients of heat exchange and capacity being exponential functions of temperature. This problem is designated as being of the automodel type and its solution is a finite expression. Under effect of the heat wave, the gas molecules dissociate and the atoms are ionized by the high temperature. The inner energy of the gas is still approximately expressed by an exponential function aT^{λ} (Ya. B. Zel'dovich and Yu. P. Rayzer, UFN, 63,613 (1958); V. V. Selivanov and I. Ya. Shlyapnikov, ZhFKh, 32, 670 (1958)). But at temperatures of millions of degrees, it is necessary to add to the energy of matter the radiative energy equal to $\sim bT^4$. The particular case of nonautomodel heat-wave propagation where $E=aT^{\lambda} + bT^4$ is the inner energy is analyzed in detail. The approximate method applied may be extended to any arbitrary dependence of the internal energy and heat flux on temperature.

158. Magnetodynamics

"The Impossibility of Rarefaction Shock Waves in Magnetic Hydrodynamics," by R. V. Polovin and G. Ya. Lyubarskiy, Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 2 (8), Aug 58, p 510

As known (L. D. Landau and Ye. M. Lifshits: "Mekhanika Sploshnykh Sred" (Mechanics of Continuous Media) Moscow 1953), the theorem of Zemplen holds in hydrodynamics stating that rarefaction shock waves are impossible, if $\left(\frac{\partial^2}{\partial p^2}\frac{1}{\rho}\right)_S > 0$. The same writers proved Elektrodinamika Sploshnykh Sred [Electrodynamics of Continuous Media] Moscow 1958) that in magnetic hydrodynamics shock waves of small amplitude are compression waves if the above relation holds. F. Hoffmann and E. Teller, (Phys, Rev., 80, 692 (1950)) showed that in an ideal gas the compression shock wave is thermodynamically unstable if the magnetic field is parallel to the disruption. The problem of thermodynamical instability of rarefaction shock waves remained unsolved. However, the theorem of Zemplen holds in magnetic hydrodynamics at arbitrary intensity of disruption and arbitrary direction of the magnetic field if, besides the above relation, the following condition is satisfied: $(\partial p/\partial T)_\rho > 0$. Increasing pressure in the shock wave leads to higher density. To clarify how the tangential magnetic field $H_\perp$ varies during the passing of the shock wave, it suffices to use the formula:

$H_\perp = H_{0\perp}\,\rho\,(v_{0x}^2 - V_{0x}^2)/(\rho_0 v_{0x}^2 - \rho V_{0x}^2)$ which follows from the conditions on the surface of the disruption (the zero index pertains to values referring to the region in front of the shock wave, V_x is the projection of Alfven velocity on the normal. Small magnetic fields $(H_x^2 < 2\pi \times \times v_{0x}^2(\rho_0/\rho(\rho+\rho_0)$ are strengthened during the passing of the shock wave. While strong magnetic fields $(H_x^2 > 2\pi v_{0x}^2(\rho_0/\rho)(\rho+\rho_0)$ are weakened. It indicates a certain smoothing role of shock waves.

The strengthening of weak magnetic fields during the passing of shock waves revealed by H. L. Helfer (Astrophys. J. 117, 177 (1953) translated into Russian, 1954). He considers it the mechanism of formation of strong interstellar magnetic fields.

Ordinary Magnetodynamic Waves," by G. Ya. Lyubarskiy and R. V. Polovin, Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 2 (8), Aug 58, pp 509

It is shown in conventional hydrodynamics (L. D. Landau and Ye. M. Lifshits: Mekhanika Sploshnykh Sred [Mechanics of Continuous Media] Moscow 1953) that in an ordinary wave, points of higher density move faster than points of lower density, if the inequality

$$\frac{\partial^2}{\partial \rho^2} \cdot \frac{1}{\rho} > 0$$ is satisfied.

In magnetic hydrodynamics, three types of ordinary waves are known: (A. I. Akhiyezer, G. Ya. Lyubarskiy, R. V. Polovin, Ukr. fizich. zhurn [in print]) fast and slow magnetosonar and Alfven waves (magnetohydrodynamic). The last type of waves is characterized by a constant density and a constant velocity. With respect to the two first types of waves, it may be proved that the points of higher density move at a higher speed if the above inequality is satisfied. It may be concluded, in particular, that waves of the automodel type are also always rarefaction waves. The dependence of phase velocity on density leads, as in conventional hydrodynamics, to the fact that in compression regions the fluid continues to compress until a shock wave is formed.

159. Two Temperatures of an Ionized Gas

"Formation of Two Temperatures in an Ionized Gas Located in a Magnetic Field," by E. Larish and I. Shekhtman, Institute of Applied Mechanics, Bucharest, Institute of Atomic Physics, Bucharest-Magurele; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 2 (8), Aug 58, pp 514-515

An ionized gas is analyzed, the ionic temperature of which may be considered as specified. The energy of cyclotron radiation emitted by the electrons in a unit of time is

$$(dE_e/dt)_c = -E_{e\perp}/t_c = -(4e^4H^2/3c^5m_e^3)E_{e\perp}$$

Here e is the charge of an electron, H - the magnetic field, m_e - the mass of an electron and $E_{e\perp}$ - the electron energy connected to their motion crosswise to the magnetic field. The energy emitted during t_c is of the same order as the electron energy. The frequency of the cyclotron radiation is $\nu \sim eH/m_e$; we assume that the gas is transparent to this frequency range. This condition is rather stringent, and in the specified problem it requires either a sufficient rarefaction of the gas or high values of the magnetic field and of the ionic temperature. If during the relaxation of the electronic and ionic components of the gas t_{eq} the

electrons have emitted a substantial part of their energy, i.e. if $t_{eq} \gtrsim t_c$, it may be expected that the electronic temperature will considerably depart from the ionic temperature.

The relaxation time for the electronic component, as mentioned by Spitzer (Physics of Fully Ionized Gases, 1955) is:

$t_r = m_e^{1/2}(3kT_e)^{3/2} / 8 \cdot 0.714\ \pi n_e e^4 \ln \Lambda$. Here T_e is the kinetic temperature of the electrons, n_e is the electron number in a unit of volume, and $\ln \Lambda$ the Coulomb logarithm. It is assumed that $t_c \gg t_r$, in this case the electron gas will have a Maxwellian distribution. To express the exchange energy between the electron and ionic gases, the Spitzer formula may then be applied:

$$\left[\frac{dE}{dt}\right]_i = \frac{E_i - E_e}{\alpha t_{eq}} = (E_i - E_e)\left[\frac{3\alpha m_e m_i k^{3/2}}{8\pi^{1/2} n_i Z^2 e^4 \ln \Lambda}\left(\frac{T_e}{m_e} + \frac{T_i}{m_i}\right)^{3/2}\right]^{-1}$$

Here m_i is the ion mass, Z - its charge and n_i their amount in a unit of volume. The factor α indicates the slowing down of relaxation due to the magnetic filed, $\alpha \sim 3$. In a quasistationary state the sum of the two equations should be equated to zero. The following equation follows therefrom for the ratio $T_e/T_i = \theta$:

$$\lambda^2 = \frac{(1/\theta - 1)}{\theta^3(1 + m_e/m_i\,\theta)} \qquad \lambda = \frac{\alpha k^{3/2} m_i}{3(2\pi)^{1/2} c^5 m_e^{7/2} Z^2 \ln \Lambda} \frac{T_i^{2/3} H^2}{n_i}$$

The condition $t_c \gg t_r$ is equivalent to the inequality $\lambda \ll 10^6$, but then the last equation is simplified: $\lambda = \theta^{-5/2}(1 - \theta)$. The curve $\theta = \theta(\lambda)$ is plotted. For large λ it is evident that $\theta = \lambda^{-2/5}$. It proves that the difference of temperatures of the ionic and electronic components of the gas may reach high values.

160. Shock Waves

"Shock Waves in Conducting Ultrarelativistic Gas," by K. P. Stanyukovich, Moscow, Higher Technical School imeni Bauman; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki; Vol 35, No 2 (8), Aug 58, pp 520-521

The passage of a flow of relativistic gas through a front of a straight shock wave is analyzed. The resulting conclusion is that the shock wave is impossible, if the velocity of gas flow behind the wave equals the speed of light for particles with a rest mass not equal to zero; inasmuch as such a velocity of the gas is not attainable.

161. Pachner Proposes Scalar Density Term for Unified Field Theory

"The Unified Field Theory in the Maxwell Approximation," by J. Pachner, Physics Institute, Advanced Technical School, Prague; Leipzig, Annalen der Physik, Vol 2, No 1/2, Aug 58, pp 36-40

The article investigates what condition must be satisfied by a unified field theory, the field equations of which, in the case of a weak electromagnetic field, are to go over into the general theory of relativity. It is shown that this condition can be satisfied only by a unified theory based on a heterogeneous Hamiltonian. The unified theory of Einstein does not satisfy this condition, since the Hamiltonian, from which the field equations are derived with the aid of the variation principle, must, in addition to the term demanded by Einstein, contain an additional scalar density. The explicit expression is given for this density. It represents a natural generalization which leads to the cosmological term.

Experimental Physics

162. An Improved Design of a Wire-Strain-Gauge

"The Use of a Detached Wire-Strain-Gauge for Measuring Magnetostriction and Thermal Expansion," by A. V. Zalesskiy, Institute of Crystallography, Academy of Sciences of USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 58, pp 71-75

An improved design of a simple detached wire-strain-gauge for measuring the temperature dependence of magnetostriction is described, as well as operational data. The instrument was designed by K. P. Belov and V. V. Shmidt (ZhTF, 23, 44, 1953) and later improved by D. I. Volkov and V. I. Checherinov (ZhETF, 27, 208 (1954)) and L. S. Levin (Izmerit. tekhnika, No 5, 22 (1956)). The wire-strain-gauge is mechanically attached to the sample by means of an intermediate rod. Such an attachment shields the wire-strain-gauge from the effect of heating. The device also proves advantageous for measuring thermal expansion of various materials with a sensitivity reaching about $2 \cdot 10^{-7}$ for 1 mm of the scale. The accuracy in measuring magnetostriction is about 5%.

163. Deuterium Absorption by Cathodes

"Measurements of the Amount of Deuterium Absorbed by Cathodes in a Gas Discharge," by A. M. Rodin, S. P. Vorob'yev, and A. A. Rodina; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 58, pp 78-82

Deuterium absorption by a cathode of a magnetic electric-discharge manometer is investigated. The application of deuterium is much superior to the use of hydrogen, because the latter is always abundant in metals. The applied method is described and it permits the detection of $1 \cdot 10^{-8}$ g of deuterium; the accuracy of measurements is about $\pm$ 5%. A special method for studying deuterium absorption by beryllium cathodes during discharge is described.

164. Improvement of a Bubble Chamber

"Bubble Chamber With Liquid Deuterium," by V. Z. Kolganov, A. V. Lebedev, S. Ya. Nikitin, V. T. Smolyankin, and A. P. Sokolov; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 58, pp 30

Deuterium was tested as an operating liquid for a bubble chamber. At the same time, its thermostat vessel was filled with liquid hydrogen and the operational range of the bubble chamber was measured. Experimental results proved that liquid deuterium, without preliminary purification of tritium, is suitable as the operating filling of a bubble chamber and that liquid hydrogen is good for filling of the thermostat vessel.

165. Test of Purity of Inert Gases

"Simplified Method of Spectral Analysis of Inert Gases for Purity," by O. P. Bochkova, L. P. Razumovskaya, and S. E. Frish, Physics Institute, Leningrad State University; Moscow, Optika i Spektroskopiya, Vol 5, No 1, Jul 58, pp 93-94

A simple photoelectric method of spectral analysis is suggested for fast and reliable purity tests for argon and other inert gases. The equipment used is described. Because the intensity of bands corresponding to N contained in A strongly depends on the gas pressure, an appropriate pressure for technical and spectrally pure A should be chosen. The method is applied in the Balashikhin oxygen plant and it may be used in checking for N in other inert gases, as well as for determining neon in helium, etc, provided that the light filters have been correspondingly adjusted in the equipment.

166. Study of Spectral Lines of Samarium

"Anomalous Variation of the Intensity of Spectral Lines of Samarium in a Direct-Current Arc," by R. R. Shvangiradze; Moscow, Optika i Spektroskopiya, Vol 5, No 1, Jul 58, pp 88-90

Observed anomalous intensity variations of Sm spectral lines are reported. Mixtures of rare earths were mixed with graphite powders and burned in an arc between carbon electrodes at a 5 amp current. The spectrograph ISP-51 and the camera UF-84 were used. The behavior of Sm differed from that of other rare earths. The intensity of the Sm lines increased with the rising of the arc current up to 6 amp and thereafter remained stationary, while spectra of other rare earths substantially increased in intensity within the studied current limits. The anomalous behavior of Sm is ascribed to the transition of Sm from the solid state to the gaseous in the arc gas cloud. The following conclusions were made in regard to practical applications: the use of Sm as a standard element in spectral analysis lowers substantially the accuracy of measurements in the spectral analysis of rare earths. The selective evaporation of Sm may considerably increase the sensitivity of impurity detection in Sm concentrates. The sensitivity for spectral detection of impurities in Sm will be higher at high arc currents, while the detection of Sm in other rare earths will be more precise at low arc currents.

167. Analysis of the Emission Line 2537 Å in an Hg Discharge

"Investigation of Divergence of a Luminous Flux of the 2537 Å Line in a Mercury Discharge," by V. P. Titushina and V. A. Fabrikant, Moscow Power Engineering Institute; Moscow, Optika i Spektroskopiya, Vol 5, No 1, Jul 58, pp 3-9

A vibrating luminiscent probe was used (V. A. Fabrikant: Izv, AN, ser. fiz. 22, 574 (1939); ZhETF, 17, 1037 (1947); ZhTF, 26, 749 (1956)) for studying the dependence of radiation flux divergence of the line 2537 Å on the electron concentration. The magnitude of divergence in a given point volume was measured by the difference between the amount of impacts exciting the atoms within a unit time and the amount of impacts destroying the excited atoms. The plotted distribution curves of div G and n_e (radiation divergence and electron concentration) clarify the character of secondary processes at various pressures and currents. In the range of intermediate pressures ($3\text{-}7 \cdot 10^{-3}$ mm Hg) and currents the radiation divergence varies linearly with the increase of electron concentration. In the axial and boundary discharge volumes tests confirmed that the excitation mechanism of radiating atoms at the 6^3P_1 level is complicated and depends on the conditions of radiation diffusion and on the value of electron concentration.

168. Plastic Luminescent Scintillators

"Absolute Yield of Luminescence of Plastic Scintillators at Gamma-Ray Excitation," by Ye. A. Andreyeshchev and I. M. Rozman; Moscow, Optika i Spektroskopiya, Vol 5, No 1, Jul 58, pp 39-43

Calibrated equipment with a photometric sphere and photomultiplier was used for determining the absolute yield of gamma-luminescence of a plastic scintillator with tetraphenylbutadiene. The averages of measured results are tabulated and show that the presence of a plexiglass container increases the current of the photomultiplier by less than a factor of two. The absolute energy yield of luminescence of the plastic scintillator with 1.5% tetraphenylbutadiene excited by Co-60 gamma-rays was found to equal 0.038. Because the average photon energy of luminescence of tetraphenylbutadiene equals 2.66 ev, it follows that for the emission of a photon 70 ev are spent.

169. Transparency of Fog for Infrared

"Investigation of the Spectrum of Fog Transparency in the Infrared Spectral Band," by V. I. Malyshev, Physics Institute, Academy of Sciences USSR, Fiz. sb. L'vovsk. un-t, No 3 (8), pp 121-125 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 23995)

The absorption spectrum of fog was studied. The fog was obtained by atomizing water or by means of intensive cooling of water vapor by liquid nitrogen. During the observation of the absorption spectrum by usual means instead of absorption bands of liquid water at 2.95 and 6.02 μ, bands of selective transparency at 2.77 and 5.8 μ were observed. According to the writer these bands correspond to a minimum of dispersion coefficient, due to anomalous behavior of the refraction index near the absorption band. To eliminate the scattering effect and to observe only the real absorption of the sample, an integrating sphere was placed directly behind the vessel with fog. This sphere captured the whole radiation scattered by the sample within an angle of about 180°. By this method it was possible to obtain absorption bands of water-drop fog at a diameter of drops of the order of 5 μ, which corresponds to absorption bands of liquid water in the form of a thin film, but differs somewhat in form as well as in position, being shifted toward long-waves by 100 cm-1, which may be due to a residual effect of scattering or to the specific character of surface molecules of water. Analogous phenomena were revealed in spectra of "two dimensional fog," drops of water deposited on a plate of solid matter.

170. Intensity of Glowing Discharge

"Effect of Some Secondary Processes on Intensity of Radiation in a Glowing Discharge," by N. A. Prilezhayeva, Tomsk University, USSR, Dokl. 7-y Nauchn. Konferentsii, posvyashch. 40-letiyu Velikoy Oktyabr. Sots. Rev. (Report of Seventh Scientific Conference, Devoted to 40th Anniversary of the Great October Socialist Revolution), No 2, Tomsk, Tomskiy un-t, 1957, pp 113-115 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 24149)

The effect of secondary processes on intensity of radiation of a glowing discharge at increasing gas pressure and current density is analyzed. An analysis of obtained correlations and a numerical evaluation of the effect of elementary processes are presented, as well as a comparison with available data in literature.

171. Absorption Analysis of Gas or Liquids

"Optimum Optical Density in the Absorption Analysis of Gas or Liquid Mixtures," by A. O. Sall, State Union Design Bureau of Analytic Instrument Building; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 316-321

Formulas for determining basic errors of an absorption analyzer, based on absorption of radiation by the analyzed mixture, are obtained. The problem of determining the optimum optical density for the absorption analyzer from the condition of the latter's minimum error value is discussed.

172. Spectrum of Germanium

"Optical Constants of Germanium in the Region 2-25 μ," by M. T. Kostyshin, Kiev State University imeni Shevchenko; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 312-315

Two methods are suggested for determining the absorption coefficient and the refraction index of solid absorbing layers, which take into account multiple reflection. One of these methods is tested on the computation of the refraction index and absorption coefficient of germanium in the region of 2-25 μ. The comparison of these methods with those by J. Simon (J. Opt. Soc. Am., 41, 336, 750, (1951)) shows the superiority of the suggested methods.

173. Relaxation in Crystallophosphors

"Relaxation Processes in Crystalline Phosphors With a Complex Spectrum of Trapping Levels," by K. K. Rebane, Institute of Physics and Astronomy, Academy of Sciences Estonian SSR: Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 307-311

Results were obtained valuable for zone models with an arbitrary spectrum of electronic trapping levels. If such a general model is compared with a phosphor, the afterglow of which drops according to the Becquerel law, the relaxation process follows from the latter law. It is shown that the condition required for a uniform decay (the invariable ratio of the numbers for filling any trapping levels) is the equality of trapping cross sections of electrons at all levels. In a particular case the model with the arbitrary spectrum of electron trapping levels has an exact solution corresponding to the decay of afterglow in the shape of a hyperbola of second order.

174. Photoluminescence of Rare-Earth-Activated Phosphors

"Investigation of Electro- and Photoluminescence Spectra of Rare-Earth-Activated Phosphors," by V. Ye. Oranovskiy and Z. A. Trapeznikova, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 302-306

Specially prepared electroluminophors activated by rare-earth elements were studied and the identity of centers of electro- and photoluminescence was established. The kinetic character of electroluminescence was also established and the relative magnitude of the portion of the crystal emitting during electroluminescence.

175. Phosphorescence of Organoluminophors

"The Dependence of the Excited State Duration of Organoluminophors on the Wavelength of the Exciting Light," by G. M. Kislyak, Poltava Pedagogical Institute; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 297-301

Studies were carried out on the effect of the wavelength of the exciting light on the duration of the exciting state and the phosphorescence spectrum of tripaflavin and fluorescein in various solvents at the temperature of liquid oxygen. The effect of the dyestuff concentration on the decay law and the duration of phosphorescence in the anti-stokes region was investigated. It was found that the dyestuff concentration produces a concentration type of decay, as found by B. Ya. Sveshnikov (DAN SSSR, 58, 49 (1947)).

176. Intensities in Combination Scattering Spectra

"Calculation of Intensities in Combination Scattering Spectra of Benzene and Some Deuterobenzenes in the Zero and First Approximation of the Valency-Optical Theory," by M. A. Kovner and B. N. Snegirev, Saratov State University; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 239-250

The intensities in spectra of combination scattering are computed for benzene and deuterobenzenes. The computation results for C_6H_6, C_6D_6, and $C_6H_3D_3$ are compared with experimental data. To take into account the polarizability of bonds and valency angles, the computations are carried out in two stages: in the usual zero approximation and in the first approximation of valency-optical schematic.

177. Atomic Terms of Holmium

"Multiplet Splitting of the Ground Term of the Holmium Atom," by V. B. Belyanin, Moscow State University, Physics Faculty; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 236-238

Measurements of superfine structure of HoI spectral lines and the constant difference method are used to determine the splitting of the ground term of the Ho atom.

178. Matrix Transformations of Atomic Terms

"Application of the Unitary Transformation for the Calculation of Atomic Terms," by O. S. Petrov, Ural Polytechnical Institute imeni Kirov; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 225-235

A new method is suggested for the diagonalization of quantum mechanical operators by means of unitary transformation. As a result of several consecutive unitary transformations to the matrix its nondiagonal elements decrease with each transformation until they become negligible. The method may be applied to the computation of multielectron atoms. As an example, the method is applied to the computation of terms of heliumlike or lithiumlike ions.

179. Anomalous Behavior in Combination Spectra

"The Anomalous Behavior of the Intensity of Combination Scattering Lines in Two Component Mixtures," by V. M. Pivovarov and L. D. Kislovskiy; State Optical Institute imeni Vavilov; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 251-255

Concentration variations of intensities of lines of combination scattering of components of a number of binary mixtures are compared with the variation character of the position and intensity of absorption bands, which are nonactual for combination scattering. The concentration dependence of the nonactual absorption band of 2,600 Å of benzene is qualitatively explained by means of a previously suggested model of "decaying oscillator." The application of this model to the actual absorption bands made it possible to clarify the character of their variations and to explain in agreement with experience the anomalies of the concentration dependence on the line intensities of combination scattering.

180. Cathodic Discharge Test for Impurities

"Use of a Hollow Cathode Discharge for the Determination of Impurities in ZrO_2. I," by Yu. I. Korovin and L. V. Lipis; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 334-336

Research proved that a discharge in a hollow cathode may be used for detecting impurities in oxides or metal oxides which are hard to evaporate. The sensitivity and accuracy of determination of a large group of elements usually is not worse than the same determination with much more complicated methods using enriched samples (R. Z. Mitchell and R. O. Scotte, J. Soc. Chem. Ind., London 66, 330 (1947)). ZrO_2 was used as typical oxide.

181. Phosphorescence of Organoluminophors

"The Decay Law of the Phosphorescence of Organoluminophors," by V. A. Pilipovich and B. Ya. Sveshnikov, State Optical Institute imeni Vavilov; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 290-296

It was confirmed that as previously found (S. I. Vavilov and A. A. Shishlovskiy Phys. Z. Sow., 5, 379 (1934); V. L. Levshin and L. A. Vinokurov, Phys. Z. Sow, 10, 10, (1936), and others), the decay curve of phosphorescence of organoluminophors deviates from the exponential in all stages of decay; the velocity of decay depends on the particular portion of the emission spectrum chosen; in advanced stages the intensity drop follows a hyperbolic law. The inconsistency of attempts to explain the nonexponential decay law of phosphorescence in the initial and in the middle stage by superposition of a spontaneous and recombination radiation is established. It is assumed that the reason for the nonexponential law of decay in these stages of phosphorescence decay is the participation of two or several metastable levels in the radiation. The existence of a second metastable level is confirmed by the difference of the polarization degree of the long-wave phosphorescence in various parts of the emission spectrum and by experimental study of variations in the spectrum and the duration of phosphorescence at anti-Stokes excitation.

182. Absorption Spectra of Dyestuffs

"Absorption Spectra of Dyestuff Solid Layers Precipitated From Solutions," by L. A. Lyzina, State Optical Institute imeni Vavilov; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 286-289

The effect of preliminary treatment of solid dyestuff layers on their absorption spectra is studied. It was established that depending on the correlation of interacting dyestuff molecules with each other and on the adsorbing forces of dyestuff molecules on the lining, the layers may be either scattering or reflecting. It is suggested that in the latter case, the shift toward longer wavelengths of the basic absorption maximum during transition of solutions to solid layers may be explained by the effect of the lining.

183. Absorption Spectra of Herapathite

"Investigation of Absorption Spectra of Herapathite Crystals," by D. A. Godina and G. P. Fayerman, State Optical Institute imeni Vavilov; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 276-281

Specially grown, thin flat herapathite crystals containing various quantities of iodine were studied. Their thickness was measured and their absorption and polarization spectra observed. The absorption indexes also were determined. The absorption of herapathite crystals in which $J_2/HJ > 1$ is a combination in agreement with Burger's law of absorption of light, of absorption within the crystal plus absorption independent of the thickness of the crystal. It is suggested that this absorption is due to a film of molecular iodine adsorbed to the crystalline surface.

184. Dichroism of Crystalline Iodine

"Dichroism of Crystalline Iodine," by D. A. Godina and G. P. Fayerman, State Optical Institute imeni Vavilov; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 282-285

Measurements of absorption spectra and polarization of thin polycrystalline iodide films exhibited strong dichroism in the visible part of the spectrum. The dichroism is the stronger the more the iodide crystals are oriented so that their optical axes are parallel. The dichroism of herapathite depends on the orientation of dichroic iodide molecules contained in the herapathite crystal.

185. Crystalline Optics

"Optics of Absorbing Crystals. III. Crystals of Lower Syngonies. Optical Axes," by F. I. Fedorov, Institute of Physics and Mathematics, Academy of Sciences Belorussian SSR; Moscow, Optika i Spektroskopiya, Vol 5, No 3, Sep 58, pp 322-333

On the basis of the canonical invariant representation of the inverse complex tensor of permittivity ε'^{-1}, general expressions for polarization of plane light waves propagating in absorbing crystals of lower syngonies were obtained, as well as expressions for complex refraction indexes of homogeneous waves. The problem of determining particular directions characterized by single-valued refraction index is solved in the general case.

Electricity

186. AlSb Types of Semiconductors

"Electric and Optic Properties of AlSb Alloys," by M. V. Kot and G. P. Sorokin, Uch. zap. Kishinevsk. un-t, 1957, 29, pp 183-193 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 23188)

The electric conductivity of four types of samples was studied: (1) massive polycrystalline, (2) single crystals, (3) films deposited in vacuum by means of evaporation of monocrystalline and polycrystalline samples, and (4) films obtained by means of vacuum evaporation of separate components; the films were obtained by evaporation onto cold as well as hot glass supports and were 0.05-1 μ thick.

It was found that the dependence of electric conductivity on temperature for massive samples was:

$$\sigma = A_1 \exp(-\Delta E_1/2kT) + A \exp(-\Delta E/2kT)$$

The first term refers to the low temperature area, the second, to the high temperature area. The conductivity mechanism is of the hole type within the whole temperature range (from -183 to -500°C).

For films thicker than 0.1 μ, obtained by evaporation onto a cold support, the measurement results of resistance versus temperature were irreproducible, but became stabilized after a certain number of measurements, the resistance of the layer always increasing in the process.

For films less than 0.1μ thick, reproducible results after preheating were not obtained. After heating in vacuum at a temperature over 230°C or in the air at a temperature of 180°C, the resistance drops sharply and irreversibly. Later it remains without change. For films evaporated onto a hot support, the results were at once reproducible. The activation energy ΔE for films is lower than for massive samples. The hole type of conductivity predominates. In the air the resistance of all films increases and the conductivity mechanism for films with an Al excess changes to the electron type. In vacuum the specific conductivity of films with an excess of Sb is lower than for films with an Al excess, and in the air the contrary is true.

The absorption of light was studied only on films. The films exhibited two maxima of absorption. The short wave absorption corresponded to intrinsic absorption (the red limit of intrinsic absorption ~0.8 μ), the long wave one to the impurities (~1.5 - 1.8 μ). The overheated film has one maximum of absorption (0.6μ). The higher the Al excess, the sharper the second maximum is expressed and the more it is shifted toward long waves. The obtained experimental results are satisfactorily explained by means of energy diagrams suggested by the authors for AlSb with either an Sb or Al excess.

187. Analysis of Impurity Centers

"Scattering of Current Carriers in Semiconductors at High Concentration of Charged Impurity Centers," by Ye. P. Pokatilov, Uch. zap. Kishinevsk. un-t, 1957, 29, pp 109-120 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 23144)

A crystal with impurities is considered as two crystalline lattices, the basic one and the one consisting of impurity, packed one into the other. Both lattices are considered slightly nonideal. In this model the electron scattering is analyzed as taking place on dislocations of periodicity of both lattices. Approximate expressions for the impurity parts of the free paths and for the mobility of the electron are obtained. These expressions depend on the concentration of impurities as related to the elasticity modulus of the impurity lattice. In the degenerate electron state it leads to the $\sim N^{2/3}$ law for the mobility.

188. Resistance of Semiconductor Materials

"Oscillographic Method for Measuring Resistances of Semiconductor Materials," by A. N. Sus and V. A. Zemlyanichenko, Uch Zap. Saratovsk. un-ta., 1956, 44, pp 83-87 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 23206)

A simple method is described, permitting the determination of the magnitude of resistance of the studied sample from the type of oscillograms.

Pulse voltage charges the capacitor containing the studied material through a kenotron during the first quarter of a period. When, during the second-quarter period, the capacitor voltage will be higher than the instantaneous voltage of the source, the kenotron is cut off and the capacitor discharges freely through the leak resistance until the capacitor charging is renewed. The voltage from the capacitor is fed directly to the vertical plates of the oscillograph, the horizontal plates receive the voltage of the source before the kenotron which completes full synchronization of voltages at arbitrary frequencies. The most convenient frequency of the feeding voltage is chosen from the condition $R_oC \sim T$, where R_o is the resistance of the sample, C is the capacity of the capacitor, and T is the period of the feeding voltage. At a frequency of the feeding voltage of 50 cycles the highest specific resistance which may be measured by this method is 10^{10} ohm.cm. Materials of lower specific resistance may be measured by means of an artificial increase of RC by means of connecting an air capacitor in parallel to the capacitor with the sample.

Electronics

189. Properties of Cathode Surface

"Change of Initial Properties of a Cathode Surface Under Action of Spark Electric Pulses," by N. I. Lazarenko, Tr. Tsentr. n.-i. labor. elektr. obrabotki materialov, AN SSSR, 1957, No 1, pp 70-94 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 23349)

The results of investigation and of practical applications of the erosion phenomenon on the cathodic surface under the action of pulse electric discharges are described. Any form of independent gas discharge is followed by erosion. A direct contacting of electrodes is preceded by a breakthrough of the gas medium at any small distances between the electrodes. Quantitative measurements show that the loss

of anode weight is proportional to the pulse energy and to the pulse number. The weight gain of the cathode exhibits a maximum. This prevents the formation of thick layers on the cathode (not over 0.1-0.15 mm). The properties of the cathodic layer depend not only on the operation, but also on the dielectric medium and the electrode material. For example, at discharge in air the layer exhibits presence of nitrogen and oxygen. It was not found possible to get a metallic layer on a graphite cathode, although graphite penetrates well into metals. For the deposition of a layer it is suggested that pulses of a period of 10^{-4} - 10^{-5} sec. be used. A detailed description of equipment for electric spark deposition of metallic coatings is provided. The advantages and disadvantages of electric spark coating are indicated. Several applications of electric spark coating are given, in particular for the improvement of corrosion resistance.

190. Flare Discharge

"Full and Critical Voltage of a Flare Discharge," by A. L. Stolov, Uch. zap. Kazansk. un-ta, 1957, 117, No 2, pp 130-132 (from Referativnyy Zhurnal -- Fizika, No 10, Oct 58, Abstract No 23331)

The measurement of a full and of a critical voltage of a flare discharge at various parameters was carried out with equipment previously described (RZhFiz, 1954, No 11, 13843, 13844). The frequency of the oscillator connected with the circuit by inductance was chosen 13.3 Mc. It was found that the full voltage increases with increasing pressure and depends strongly on the cooling of the electrode. If the electrodes are cooled this voltage does not depend on the material of the electrodes, it changes with a change of the curvature of the electrodes, and it depends on the type of gas increasing respectively in the following order: H_2, air, N_2, CO_2, SO_2. The preionization of the space lowers somewhat the voltage of the flare discharge.

The critical voltage also increases with pressure, but exhibits no dependence on the type of gas and does not depend on external ionization of space and increases slightly with increasing radius of curvature of the electrodes.

191. Possibility of Superconductivity in Ferromagnetics Considered

"On the Question of the Absence of Superconductivity in Ferromagnetics," by S. V. Vonsovskiy, Corresponding Member, Academy of Sciences USSR, and M. S. Svirskiy, Institute of the Physics of Metals, Ural Affiliate, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 2, 11 Sep 58, pp 204-207

The fact that superconductivity has not yet been observed in ferromagnetic metals and Ginzburg's proposal that the observed absence is possibly explained by the masking effect of spontaneous magnetization are noted. The problem of whether the outer electron system of a ferromagnetic exhibits semiconducting properties is considered from the aspect of the new microscopic theory of semiconductivity. In particular, the energy spectrum of s-electrons in the (s-d)-exchange model of ferromagnetic metals is treated.

It is concluded that the absence of superconductivity in ferromagnetics is an intrinsic property of their electron system and that this property is due to the relatively strong (s-d)-exchange interaction. In the opinion of the authors, superconductivity can be observed only in those ferromagnetics which have a very weak (s-d)-interaction. One case given for which superconductivity is considered possible is that of a sample at low temperatures where the ratio of the thickness to the lateral dimensions is on the order of 10^{-4}.

192. Book on Structural Analysis Stresses Electronographic and Harmonic Methods

Lektsii po Strukturnomy Analizu (Lectures on Structural Analysis), by B. Ya. Pines, Publishing House of Khar'kov University; Khar'kov, 1957, p 456

The book is based on a lecture course given by the author to students specializing in X-ray structural analysis. It is divided into two parts. Under the heading "The Crystalline State," are included elements of the geometry, physics, and chemistry of crystals "necessary for an understanding of structural analysis." The second part, "Methods of Structural Analysis," contains the theory of X-ray and fast-electron scattering, and a description of the experimental methods used in structural analysis, particularly in regard to metallurgy. A separate chapter is devoted to electronographic methods. The book discusses the problems of determining atomic structure and additional structural characteristics of polycrystalline

substances, such as texture, internal stresses, dispersion of coherent scattering regions, and concentration of solid solutions. Particular attention is given in the present edition to the newest method of determining structure, that of harmonic analysis, to the harmonic synthesis of structure, and to nonequilibrium states. A bibliography of 143 entries is included.

Mechanics

193. All-Union Conference on Theoretical and Applied Mechanics To Be Held in Summer of 1959

"On Calling the All-Union Conference on Theoretical and Applied Mechanics," (signed) Organization Committee of the All-Union Conference on Theoretical and Applied Mechanics; Kiev, Prykladna Mekhanika, Vol 4, No 3, Jul-Sep 58, inside back cover

The USSR National Committee on Theoretical and Applied Mechanics, in conjunction with the Department of Technical Sciences of the Academy of Sciences USSR, the Institute of Mechanics of the Academy of Sciences USSR, and Moscow State University imeni M. V. Lomonosov, will conduct the All-Union Conference on Theoretical and Applied Mechanics in the summer of 1959.

The work of the conference will be conducted in three sections:

1. Section on General and Applied Mechanics, including problems on the foundations of mechanics, analytical dynamics, the mechanics of systems and solid bodies, the theory of oscillations and stability of motion of mechanical systems, the kinematics and dynamics of mechanisms, and the applied theory of gyroscopes.

2. Section on the Mechanics of Liquids and Gases, including problems on the hydrodynamics of ideal and viscous liquids, aerodynamics, gas dynamics, magnetohydrodynamics, the theory of turbulence, boundary layers, and the hydrodynamical theory of filtration.

3. Section on the Mechanics of Solid Bodies, including problems on the theory of elasticity, plasticity, and creep, theoretical problems in structural mechanics, and problems in soil mechanics.

The Organization Committee created to conduct the conference is composed of the following members: I. I. Artobolevskiy; N. Kh. Arutyunyan; A. A. Dorodnitsyn; A. A. Il'yushin; A. Yu. Ishlinskiy; S. V. Kalinin, deputy scientific secretary; M. V. Keldysh; P. Ya. Kochina; L. G. Loytsyanskiy; A. I. Lur'ye; G. K. Mikhaylov, deputy scientific secretary; N. I. Muskhelishvili, chairman; A. A. Nikol'skiy; G. I. Petrov; Yu. N. Rabotnov; V. V. Rumyantsev, scientific secretary; G. N. Savin; L. I. Sedov, deputy chairman; S. V. Serensen; V. V. Sokolovskiy, deputy chairman; V. V. Struminskiy; S. A. Khristianovich; and N. G. Chetayev.

The Organization Committee invites scientific workers of scientific research establishments, higher educational institutions, and industry of the USSR to participate in the conference.

It is asked that preliminary announcements of papers with authors indicated be sent to the Organization Committee by 1 December 1958. To be included in the program of the conference, the papers with annotations and abstracts must be submitted to the Organization Committee no later than 1 February 1959. The abstracts must be submitted in three copies and no more than 800 printed characters. An English translation of the title must be included. Only those papers will be included in the conference program which consist of unpublished scientific work containing new results.

Complete texts of the papers, no longer than 10,000 words (including illustrations), must be submitted, after notification by the Organization Committee that the paper will be included in the conference program, no later than 40 days before the opening of the conference.

All correspondence should be addressed to: Organization Committee, Moscow, D-40, Leningradskiy Prospekt, 7, Institute of Mechanics, Academy of Sciences USSR with the notation: "For the Conference on Mechanics."

194. Characteristics of Gas Behind Shock Wave Given

"On the Unsteady Motion of Gas Ejected by a Piston With Consideration of Counterpressure," by N. N. Kochina and N. S. Mel'nikova; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 2, 11 Sep 58, pp 192-195

The air ejected by explosion products is considered in the point explosion problem. The motion of the gas is modeled on the expansion of a piston which moves in accordance with a given law. This law takes counterpressure into account. A system of linear first-order differential equations is solved to obtain the velocity, density, and pressure distribution of air behind the shock wave. Graphs of these distributions are given for different values of the constants in the law for piston motion. Numerical methods were used to solve the equations.

195. Possibility of Shock Wave of a Given Type Shown

"On Certain Exact Solutions of the Equations of Gas Dynamics," by S. S. Grigoryan, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 121, No 4, 1 Aug 58, pp 606-609

Considers the possibility of "that motion of an ideal, non-heat-conducting gas with shock wave which possesses the property that there exists a region behind the shock wave in which the speed of sound is different from zero, but if disturbances of the motion are made in it, these disturbances never reach the shock wave; or more specifically, of creating in this region a second shock wave which propagates behind the first but never reaches it." An exact solution to the problem is given on the basis of certain exact solutions of the equations of nonstationary gas dynamics. The author notes that there are other classes of solutions of the gas dynamics equations than those obtained which will satisfy the above conditions.

196. Expected Error in Direct Approximation of Shell Deformations Given

"Error of Direct Methods in the Nonlinear Theory of Shells," by I. I. Vorovich, Rostov State University; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 2, 11 Sep 58, pp 196-199

Two methods for approximating the solution of a nonlinear boundary value problem for the displacement of points on the surface of a shell under large deformations of the shell are examined. Theorems imposing limits on the error to be expected in the direct approximation methods of P. F. Papkovich and Kh. M. Mushtari are presented.

Miscellaneous

197. Experimental and Practical Uses of Radioactive Isotopes in China

"China's Accomplishments in the Use of Radioactive Isotopes in Recent Years," by Chang Chia-Hua (張家驊), Institute of Atomic Energy, Academia Sinica; Peiping, K'o-hsueh T'ung-pao (Scientia), No 18, 1958, pp 559-562

This item reports the extent of the use of radioactive isotopes in China during the latter half of the First Five-Year Plan. Methods and/or principles involved in the use of isotopes to solve problems in industry, agriculture, and medicine and to conduct scientific research are presented with mention of specific institutions concerned. The information includes the following.

Radioactive logging of oil wells and mine shafts is a new technique used in petroleum and coal prospecting in China. China is now able to produce a gamma-gamma well logging apparatus comparable to the Soviet RARK Model. It is expected that the procedure will be used widely throughout the country when isotopes are mass-produced in China.

Gamma Ray detection of undesirable properties of metal products is conducted in the various branches of Chinese industry. Radium, iridium 192, cobalt 60, and thurium 170 are among the isotopes used. The Shih-ching-shan Iron and Steel Works and the Iron and Steel Research Institute (鋼鉄研究院) use isotopes to test new blast furnaces for needed repairs. The experimental blast furnace at the Pao-t'ou Iron and Steel Company is also tested by the same method.

The Research Institute on Utilization of Materials, First Ministry of Machine Industry (一机部 材料应用科学研究所), Shanghai, has accumulated enough experience in radioactive detection of friction and wear on machine parts to be the future center of technical instruction on that area of concern. The Cement Research Institute (水泥研究院) has used cobalt 60 to evaluate the efficiency of experimental rotary kilns and to determine ways to improve them.

That radioisotopes can be used to provide automation in production processes was demonstrated by the Institute of Coal Research (煤炭科学研究院) when it designed and tested a gamma ray and Geiger counter system for automatic ventilation of coal mine shafts.

In the field of agriculture, isotopes have been used to solve problems related to soil water regime, appropriate application of fertilizers, crop storage, growth and development of plants, and the selection and propagation of quality strains. Most of the work has been done at the Chinese Academy of Agricultural Sciences.

In the field of medicine, radioactive isotopes are used in diagnostic procedures, therapy, and pathological studies. Some hospitals in the country have had experience with natural radium so there should be no great technical difficulties in promoting the use of artificial isotopes. A special hospital equipped with a cobalt therapy machine having the equivalent of 400 grams of gallium [sic, probably should have been "radium"] has been set up in Peiping for tumor patients. Other hospitals use radioactive iodine and phosphorus for thyroid diseases and skin cancer.

As examples of the use of radioactive isotopes in Chinese scientific research "during the past 3 years," the following are mentioned:

Zinc 65 has been used at Peking University to study diffusion in semiconductors. Research results contribute toward an understanding of how impurities affect the properties of semiconductors.

Scientists at the Chinese Academy of Medical Sciences have used methionine tagged with sulfur 35 in developmental embryology. They proved that only growing cells assimilate nutrients. They also used the same compound in comparative studies on the rate of protein synthesis in various organs in vivo. Stibium 124 was administered to rabbits in studies designed to yield data which could be used in setting up dose schedules for antimony compounds in the treatment of schistosomiasis. Carbon 14 was used in studies on the fate of acetic acid in the body. It was found that acetic acid may become carbon dioxide by oxidation or cholesterol and fatty acids by synthesis.

In the production of "666" [1, 2, 3, 4, 5, 6-hexachlorocyclohexane], gamma radiation from cobalt 60 was used at the Institute of Atomic Energy, Academia Sinica, to raise the percentage production of the gamma isomer, the effective insecticide, from 14-16 percent to 18 percent.

Carbon 14 is being used at Peking University and at the Institute of Plant Physiology, Academia Sinica, to investigate the process of photosynthesis. Studies on how the silkworm makes silk are being made also with radioactive carbon at the Institute of Experimental Biology, Academia Sinica. The academy's Institute of Biochemistry is active in the preparation of tagged compounds. Amino acids tagged with radioactive isotopes represent one of the institute's recent achievements.

The author states that before China could produce the radioisotopes itself, they were obtained regularly from the USSR.

198. Hungarian, Soviet, Rumanian, and East German Research in the Physics of Crystals and Semiconductors

"Report Concerning a Series of Papers on Crystal Physics,"
by Janos Boros; Budapest, Fizikai Szemle, No 6, 1958,
pp 194-196

The Lorand Eotvos Physics Society (Eotvos Lorand Fizikai Tarsulat) organized a program for a meeting in Budapest, 18-19 December 1957, consisting of the presentation of a series of papers on crystal physics and semiconductors. There were 18 papers, four of which were read by foreign guests. First Secretary Gyorgy Szigeti opened the series and extended greetings to the president of the society, Academician Zoltan Gyulai, on the occasion of his 70th birthday. He also greeted the foreign guests:

Prof D. A. Petrov, chief of the Metallurgical Institute of the Academy of Sciences USSR; Prof O. Stasiw, director, Berlin Institute for Crystal Physics, Academy of Sciences of the German Democratic Republic; Prof Laszlo Tihamer [or Tihamer Laszlo], chief, Physics Institute of the Bolyai University in Cluj [Rumania]; and physicist H. Lorenz, chief, Physics Department, Academy for Social Hygiene in Berlin.

The first paper was given by Imre Tarjan of the Medical Physics Institute (Orvosi Fizikai Intezet), Budapest; it was titled "Domestic Research on the Production of Artificial Single Crystals." Zoltan Gyulai is working on the production of quartz and alkali halide crystals; Bela Lanyi is directing the production of ruby crystals; Geza Schay is directing the production of ethylenediamine tartrate crystals; Seignette salt single crystals are being grown in the Physics Institute of the Science University in Budapest; and crystals are being produced in the Medical Physics Institute of Budapest for optical, scintillator counter and other applications. Production of artificial quartz crystals is still in the preliminary stages and still too expensive to compete with natural quartz crystals.

Hermann Lorezn (Berlin) read a paper titled "Contributions of Solid State Physics to the Problem of Silicosis." Experimental results show that the particles which cause the disease have a crystalline structure [sic].

Tibor Hoffmann of the Telecommunications Research Institute (Tavkozlesi Kutato Intezet), Budapest, read a paper titled "A Few Comments on the Problem of Crystal Growth." He showed, on the basis of various theoretical considerations, that the size of a seed crystal must correspond to a number of atoms per crystal from 500-800 to 6,000-9,000. The present study was an attempt to analyze the course of isothermal crystallization. The author stated that at some high but not too high temperature crystals begin to grow, but that on reaching a certain size, again begin to return to the liquid state. Only at the melting point or below will these seeds stabilize themselves. The relationships underlying the development and melting of seeds conform in some respects to the transitional border layer theory of Professor Gyulai.

Bela Jeszenszky, of the Experimental Physics Institute (Kiserleti Fizikai Intezet) of the Construction Industry and Transportation Technical University (Epitoipari es Kozlekedesi Muszaki Egyetem), Budapest, read a paper titled "A Contribution to the Mechanism of Na Cl Crystals Growth." His observations indicate that spiral growth plays an important role in crystallization from fused Na Cl. He is continuing his studies using etching techniques.

Ferenc Bukovszky, of the above institute, read a paper titled "An elementary method for the calculation of the Madelung constant for Na Cl and Cs Cl."

D. A. Petrov (Soviet Union) read a paper titled "Some Problems Pertaining to the Growth, Structure, and Properties of Semiconductor Single Crystals." Germanium and silicon single crystals are now being mass-produced. The method most widely used is the Czohralski method. Petrov discussed the relationship of the properties of the fused medium to the properties of the single crystals grown therein and pointed out that the most perfect single crystals could be grown as threads or needles from the vapor phase.

Bela Lanyi and Istvan Csordas of the Chemical Technology Institute (Kemiai Technologiai Intezet) of the Technical University, Budapest, read a paper titled "Preparation of Microdispersed Alundum and Its Behavior Under Various Physical Stresses." The stability of alundum under mechanical stress is greatly increased by comingling the alpha-alundum crystals in such a way as to avoid the presence of foreign particles between them. $Al_2 O_3 \cdot 3 H_2 O$ was prepared from 99.99 percent pure aluminum. Heat treatment transformed this into gamma-alundum and then into alpha-alundum. This was ground into dough in a watery medium and the objects formed of this dough were shrunk at 1,480 degrees centigrade into a material with a density of 3.9 grams per cubic centimeter. Steel-working tools cast from this material (using a mixture containing ammonia) gave diamondlike performance.

Istvan Koncz of the Mechanical Technology Institute (Mechanikai Technologiai Intezet) and Mrs Marta Dery Koncz of the Chemical Technology Institute of the Technical University, Budapest, read a paper titled "Growth of Metal Crystals in van Arkel Type Reactions."

Istvan Naray-Szabo of the Central Chemical Research Institute (Kozponti Kemiai Kutato Intezet) of the Hungarian Academy of Sciences read a paper titled "Our Work in the Area of Crystal Structure Determination, 1945-1957." Naray-Szabo and Neugebauer determined the structure of sodium iodate in which there are pyramidal $I O_3$ groups. Naray-Szabo did detailed studies of Perowski-type structures. Naray-Szabo and Janos Horvath developed a theory for composite crystals. Naray-Szabo and Tobias examined the X-ray diagrams of boron layers precipitated on tungsten or molybdenum wires from $B Br_3$ vapor and they found that there is a tetragonal and a hexagonal modification present in the layer. Sasvari and Papp developed a method for using an electron-multiplier tube to measure the intensity of X-ray radiation and for using the measurements to determine crystal structure. The smallest intensity detectable by the electron multiplier arrangement is 270 photons per second. Sasvari developed a procedure by aid of which internal structure can be

determined with great precision from X-ray reflections. Sasvari determined the structure of Al $(O H)_3$. It was found to be of the monoclinic system in contrast to Montoro's old determination. Millner, Hegedus, Sasvari, and Neugebauer determined that beta-tungsten has an A 15 type structure. Sasvari and Zalai examined the structure of aluminum hydroxides. Sasvari demonstrated, concerning the hexahydrate of uranyl nitrate, that it had a spatial group of C_{2v}^{12}. Sasvari showed, concerning AX structure types, that these can be made up of the most densely placed ion planes where the anions and cations must be placed in exchangeable positions.

Kalman Sasvari (of the above institute) read a paper titled "The Crystal Structure of Staurolite." Reviewing the earlier work of Naray-Szabo, Juurinen, and Hurst, the author sought to show that the placing of the ions is such that the Pauling coordination principle is fulfilled for every anion.

Gyorgy Turchanyi of the Medical Physics Institute, Budapest, read a paper titled "Concerning the Problem of Na Cl Cleavage." His studies were done together with Imre Tarjan.

Gyula Zimonyi of the Experimental Physics Institute of the Construction Industry and Transportation Technical University, Budapest, read a paper titled "Examinations of Artificial Quartz Crystals."

O. Stasiw (Berlin) read a paper titled "The Location of Absorption Bands of Electron Disturbance Patterns in Ion Lattices." The paper concerned an examination of long-wave absorption bands of silver halide crystals containing O, S, Se, and Te ions.

Tibor Neugebauer of the Physics Institute of the Lorand Eotvos Science University, Budapest, read a paper titled "Structure of Intermetallic Compounds Exhibiting Semiconductor Properties." Quantum-mechanical calculations concerning polarization phenomena in intermetallic compounds with semiconductor properties lead to the conclusion that in the case of 3-valent ions the electrons cannot be considered as belonging to the ions. In the case of intermetallic compounds with semiconductor properties, the strong polarization covers up the ion character.

Pal Tomka of the Experimental Physics Institute of the Construction Industry and Transportation Technical University, Budapest, read a paper titled "Surface Rectification in Alkali Halide Crystals." In pure grown alkali halide crystals there is a rectification effect between two plate electrodes. This occurs with crystals which also exhibit deviations from Ohm's law. Both effects show a similar dependence on temperature. The phenomenon can be analyzed with a model based on the example of a N-P-N germanium junction transistor.

Laszlo Tihamer (Cluj) read a paper titled "Morphological Data Pertaining to the Growth of Heteropolar Crystals."

Sandor Csaszar of the Experimental Physics Institute of the Construction Industry and Transportation Technical University, Budapest, read a paper titled "A Rectificiation Effect in Na Cl Crystals."

Gyorgy Gergely and Istvan Hanges of the Telecommunications Research Institute, Budapest, read a paper titled "Energy Losses of Cathode Rays in Silicate Films." The speed loss of electrons passing through Si O_2 was determined by the light emission of an underlying layer of Zn S - Ag microcrystals. The losses can be described with either the Stincfield or the Dowling-Sewell formulas.

199. Organizational Structure of Institute of Nuclear Physics in Alma-Ata

"Institute of Nuclear Physics in Alma-Ata," by I. Dem'yanikov, Candidate of Physicomathematical Sciences, deputy director, Institute of Nuclear Physics; Alma-Ata, Kazakhstanskaya Pravda, No 219, 20 Sep 58, p 3

A new Institute of Nuclear Physics is being built on a 450-hectare site at the foot of the Zailiyskiy Aja-Tau Mountains near Alma-Ata.

The institute will be under the Academy of Sciences Kazakh SSR and is to be the center for nuclear and physical research in the republic.

The Institute of Nuclear Physics will be equipped with a large reactor and a number of laboratories for developing methods and equipment for the utilization of radiation emitted by radioactive substances and isotopes in geology, mining, metallurgy, chemistry, agriculture, biology, and medicine. Provisions have been made for the establishment of a special Scientific Sector of Applied Physics with a special physics building and a building for a Radiochemistry Laboratory.

To carry out research on the structure of matter, the institute will establish a Scientific Sector on the Structure of Matter. This sector will include the following laboratories: Nuclear Reactions, Cosmic Rays, Radiation Emitted by Radioactive Substances, Computing Machines, and a Division of Theoretical Physics.

The institute will also have a Scientific Sector of Technical Physics which will include the laboratories of the former Physicotechnical Institute, i.e., Laboratory of Metal Physics, Spectral Analysis, Electronics and Automation, and the following new laboratories: Semiconductors, X-Ray Method of Research, and Experimental Instrument Construction (Building).

The institute will have first-rate mechanical shops with a design bureau, and a Cryogenic Station for conducting low temperature research.

At present, the institute has nearly 200 workers, and will have nearly 900 when the institute is completed.

X. MISCELLANEOUS

200. Status of Planning Organizations in USSR

"Improve the Work of Planning Organizations," by A. Teplitskiy, Moscow, Promyshlenno-Ekonomicheskaya Gazeta, No 96, 13 Aug 58, p 2

In discussing the network of planning organizations in the USSR, the author points out that in the analysis of the structure of the branch planning institutes only some 10-15 percent of the personnel are technologists and that these institutes on the whole do not have the necessary laboratories or shops to make a complete study of the technology required to solve problems in industry.

The author proposes: "Would it not be better to convert current planning institutes into institutes of scientific research and planning of the development of technological processes, to absolve them of the planning of all construction functions (construction building power engineering, water supply, etc.)?" Much of the planning is not in keeping with actual problems, as for example, "the Kuybyshev Cement Plant has not yet been completed, however, plans are already being prepared for its expansion and increasing its production."

Thousands of persons are employed in the hundreds of planning organizations in the USSR. The size of the organizations vary, some employ several thousand and others only 20.

"The planning organizations [institutes] have not been changed in any way even after certain ministries have been abolished, and at present every establishment is being planned by a branch planning institute. For example, in Stavropol'skiy Rayon a number of plants are being planned which are located on a single tract of land and the plants are situated next to one another. However, the planning work is being conducted by several planning institutes from various cities and subordinate to various organizations. Every planning institute plans its 'own' establishment, i.e., Giprokauchuk is planning the plant SK, Giprobum is planning a cast [resin] products plant, etc."

Planning institutes are currently subordinate to administrations, ministries, Gosplan USSR, Gosstroy, committees, sovnarkhozes, oblast and city executive committees, and ministries of union republics.

The author points out that if the system of planning were reorganized billions of rubles would be saved and the quality of work improved at the same time.

201. New Soviet Institutes To Be Established in 1958-1959

"On the Road Toward Continuous Technical Progress," by V. Kucherenko, Chairman, State Committee on Construction of the Council of Ministers USSR; Moscow, Izvestiya, No 191, 10 Aug 58, p 3

The Council of Ministers USSR has charged the State Committee on Construction USSR with working out and consolidating the plan for the most important scientific research in the fields of construction, construction material industries, and construction and road building machines for 1959-1961.

In connection with this, in 1958-1959 there will be established new scientific research organizations for construction in Vladivostok, Krasnoyarsk, and Tashkent. An affiliate of the Scientific Research Institute of Agricultural Buildings and Structures is to be established in Orel. Affiliates of the All-Union Scientific Research Institute of the Cement Industry will be established in Krasnoyarsk and Chimkent.

The Ministry of Transport Construction USSR has been charged with establishing in Novosibirsk an affiliate of the All-Union Scientific Research Institute of Transport Construction, while the Ministry of Electric Power Stations has been charged with establishing in Krasnoyarsk an affiliate of the All-Union Scientific Research Institute of Hydraulic Engineering imeni B. Ye. Vedeneyev. An affiliate of the All-Union Highway Scientific Research Institute is to be established in Omsk. All of the above affiliates will be staffed by specialists from Moscow and Leningrad.

202. New Institutes To Be Established in Academy of Sciences Kirgiz SSR

"New Scientific Centers in Kirgiz SSR" (unsigned article); Vil'nyus, Sovetskaya Litva, No 183, 5 Aug 58, p 1

The Council of Ministers Kirgiz SSR has approved the 7-year plan for scientific research in the republic; part of the plan is the establishment of six new institutes. The new institutes will be the Institute of Mining and Metallurgy (Institut Gornogo Dela i Metallurgii); the Institute of Power Engineering (Institut Energetiki); the Institute of Construction, Architecture, and Construction Materials (Institut Stroitel'stva, Arkhitektury i Storitel'nykh Materialov); the Institute of Physics and Mathematics (Institut Fiziki i Matematiki); the Institute of Soil Sciences (Institut Pochvovedeniya), and the Institute of the Kirgiz Language (Institut Kirgizskogo Yazyka). All of these institutes will be under the Academy of Sciences Kirgiz SSR.

203. Industrial Institute Build-Up at Stalino, Ukrainian SSR

"Institutes Are Moving to the Donbass," (unsigned article); Kiev, Pravda Ukrainy, No 194, 22 Aug 58, p 3

The Institute of Mining, Academy of Sciences Ukrainian SSR, has been transferred from Kiev to Stalino. The institute will conduct research on obtaining coal from great depths and on the improvement of the system of mining coal. A number of the divisions of the institute will operate in Krivoy Rog, Dnepropetrovsk, Khar'kov, and Kiev.

At present there are 20 scientific research institutes in Stalino and the Donbass area which are directly involved with the heavy industry of the Donbass. Many of the 20 institutes either have been recently established or have been transferred from Moscow, Kiev, and other major cities.

A new Planning and Technological Institute of Machine Building has been established near Stalino on the base of the Novo-Kramatorsk Plant. Two new institutes have been organized in Stalino -- the Institute for the Construction of Mine Superstructures (Institut Nadshakhtnoga Stroitel'stva), established by the Academy of Construction and Architecture Ukrainian SSR, and the Institute for the Formation of Explosion-Proof Electrical Equipment (Institut po Sozdaniyu Vzryvobezopasnogo Elektrooborudovaniya). In addition, a branch of the Ukrainian Institute of Metals is being formed.

204. New Institutes for Construction Formed in Various Soviet Cities

"Institutes for Construction" (unsigned article); Moscow, Sovetskaya Rossiya, No 193, 10 Aug 58, p 3

The Academy of Construction and Architecture USSR has formed new Scientific Research Institutes for Construction in Rostov-na-Donu, Tashkent, Krasnoyarsk, and Vladivostok. These institutes will draw inferences from the experience of mass erection of buildings and structures and will study the practical application of the construction of leading industrial methods.

205. New Soil Sciences and Agrochemistry Institute Established in Armenian SSR

"New Scientific Research Institute" (unsigned article); Yerevan, Kommunist, No 211, 7 Sep 58, p 4

By decision of the Council of Ministers Armenian SSR, a new Scientific Research Institute of Soil Sciences and Agrochemistry (Nauchno-Issledovatel'skiy Institute Pochvovedeniya i Agrokhimii), Ministry of Agriculture Armenian SSR, has been established.

The institute will conduct research on the utilization of local and chemical fertilizers for improving the quality of the soil of many kolkhozes and sovkhozes of the republic. The institute will also study the geography and genesis of the republic's soil.

206. Hungarian Academy of Sciences General Meeting, 15-20 December 1957

"Report of the Presidium of the Hungarian Academy of Sciences," by Istvan Rusznyak, President, Hungarian Academy of Sciences; Budapest, Magyar Tudomany, Jan-Feb 58, pp 19-32

Due to illness of the first secretary, this report was prepared by the entire presidium and read by the president. The report covers subjects not usually presented in such a report because it reviews the past 8 years of the academy in an effort to answer those who consider the socialist organization of the academy a mistake. Among the evidences of improvement due to this organization is the increase in support made available to the academy: in 1938, the budget of the academy was roughly 600,000 pengo; in 1953, it was 140 million forints; and in 1957, it was 147 million forints. Among the errors committed in the past 8 years was its close adherence to the Soviet model of organization, as well as some economic and political mistakes. Scientific achievements of the past 8 years include: significant work in linear algebra, and probability; achievements in the area of a new statistical theory of the atoms; establishment of the Central Physics Research Institute (Kozponti Fizikai Kutato Intezet) with more than 200 researchers employed in nuclear physics research and in a series of experiments on the fundamental properties of light, uranium extraction from coal ash by the Atomic Nuclear Research Institute (Atommag Kutato Intezet) in Debrecen complete geological mapping of the country, preparation and use of lapinized vaccine against hog cholera achievements in muscle and protein research in the area of infantile toxicosis and astrophy; and achievements in virus research.

No academicians were excluded from academy membership as a result of the October 1956 events, but the right of some to hold office has been suspended. At the 1 December 1956 meeting of the academy, Academy Vice-President Lajos Ligeti was entrusted with execution of the president's tasks and Deputy First Secretary Geza Bognar was entrusted with execution of the first secretary's tasks. Cooperation with friendly countries is increasing; an example of this can be found at the Atomic Nuclear Research Institute which is working closely with Moscow.

"Supplement to the Presidium Report Given at the General Meeting of the Hungarian Academy of Sciences -- a Brief Report on the Work Done Since the May 1956 General Meeting"; Budapest, Magyar Tudomany, Jan-Feb 58, pp 33-48

The Hungarian Academy of Sciences has 23 institutes, 4 laboratories, and 4 research groups working on significant academic projects involving 307 university faculties. There are 2,100 scientific researchers, auxiliary personnel, and administrators with academy status.

The Mathematical and Physical Sciences Department (Matematikai- es Fizikai Tudomanyok Osztalya) has a number of institutes and subdepartments the work of which is briefly indicated below.

The Central Physics Research Institute (Kozponti Fizikai Kutato Intezet) has a Spectroscopy Department which is engaged in work on the spectrography of the NO radical on the improvement of an electronically controlled spark and arc inductor, on spectroscopic analysis of isomer compounds (analysis of the interdependence between spectrograms of a compound and its chemical or spatial structure), and on the development of differential spectrography. The Cosmic Radiation Department of this institute is working on high energy nuclear interactions produced by cosmic radiation, using counter-tube coincidence equipment a cloud chamber, and photo-emulsion techniques. This department has been collecting data since 1 January 1958 for the International Geophysical Year. This department has also been using a 10-centimeter and a 14-centimeter Michelson interferometer to measure the nature of visible light; in examining the dispersion of the interference phenomenon at low intensities, it has been established that the dispersion of the interference pattern is essentially the same as that obtained with high intensities. The Atomic Physics Department of this institute has turned from the construction of equipment to research in nuclear physics and is also engaged in work on the possibility of fusion energy production. The Electromagnetic Waves Department is examining the interaction of electromagnetic radiation with matter and free electrons; it is also engaged in nuclear polarization experiments concerned with radio-frequency spectroscopy utilizing the Averhauser effect. The Radiology Department has developed new methods for measuring the radioactivity of air and rain, perfected the film dosimeter, and produced large quantities of plastic containing phosphorus for use in scintillation measurements. The Department of Magnetics has produced magnetic memory units with square hysteresis curves. The rings produced have some magnetic characteristics which are better than the available American-produced rings. Two departments -- the Neutron Physics Department and the Nuclear Chemistry Department -- have already begun work in association with the experimental nuclear reactor of the Central Physics Research Institute.

The Atomic Nuclear Research Institute (Atommagkutato Intezet) in Debrecen has done work on extracting uranium from coal ash and has used a cloud chamber to prove the existence of the neutrino.

The Theoretical Physics Research Group (Elmeleti Fizakai Kutato Csoport), working on the statistical theory of the atom has shown that the behavior of the Gombas model of the atom is closely analogous to the wave mechanics atom. In regard to the theory of high pressures, the group has shown that previously accepted density-pressure diagrams need substantial correction. The group has developed a new perturbation theory and has shown further interconnections between statistical theory and wave mechanics.

The Mathematics Research Institute (Matematikai Kutato Intezet) has done significant work on the theory of probability, on further development of matrix theory, on problems of series theory, especially in orthogonal series solutions and approximation theory, and in connection with methods for the summation of power series. This institute has a Function Analysis Department and a Mathematical Logic Group, both working in Szeged. The Logic Group is designing a logic machine.

The Cybernetics Research Group (Kibernetikai Kutato Csoport) began work this year on the design and use of digital electronic computers. Technical data were provided by the Soviet Union. The M-3 electronic computer was designed by this group for Hungarian manufacture.

The Agricultural Sciences Department (Agrartudomanyok Osztalya) of the academy also has a number of institutes and laboratories. The Soil Study and Agrochemical Research Institute (Talajtani es Agrokemiai Kutato Intezet) has developed a procedure for increasing the productivity of drifting sandy soil. This procedure is now being introduced in Egypt and Israel. The institute also uses isotopes in studying the effectiveness of soil additives. The Sopron Soil Biology Research Laboratory (Soproni Talajbiologiai Kutato Laboratorium) is working on an antibiotic derived from actinomyces, and on soil organism ecology. The Martonvasar Agricultural Research Institute (Martonvasari Mezogazdasagi Kutato Intezet) has developed MV-39 hybrid corn and IB-413 flax. The Animal Health Research Institute (Allategeszsegugyi Kutato Intezet) has worked on brucellosis, listerellosin, and leptospirosis, and has produced a brucella variant with immunization potential; it has developed an immunodiagnostic test for ornithosis and has applied "tetracyclin" in the prevention and treatment of gastritis and enteritis in hogs. The Agricultural Operations Institute (Mezogazdasagi Uzemtani Intezet) has developed methods for calculating costs and profits in agriculture.

The Biological and Medical Sciences Department (Biologia- es Orvosi Tudomanyok Osztalya) of the academy does much work outside any formal institute. Using conditioned reflex and electrophysiological methods in examining the central nervous system, it has established that a specific system for the inhibition of orientation reflexes exists in the hypotholmus. Experiments done with "capsaicin" show that this substance paralyzes the chemoreceptors over a long period of time. New antibiotic producing strains have been isolated and some have given practical results (Degranol, Gastropin, antifungal materials, etc.). This department has only one medical research institute, the Experimental Medical Sciences Research Institute (Kiserleti Orvostudomanyi Kutato Intezet). This Institute has no building of its own but works in several facilities and has the following departments: the Pharmaceutical Research Department, producing "Prymicin" and new broad spectrum antibiotics); the Pathology Department is engaged in research on blood circulation, lymph circulation, kidney function, neuroendocrinology, and hematology; and the Morphology Department is using isotope methods in examining the reticuloendothelial system, which works on cell proliferation problems and on the histophysiology of the glands of infants. The Biological and Medical Sciences Department of the academy also has a Child Psychology Institute (Gyermeklelektani Intezet) which deals with problems of child, educational, and clinical psychology.

Originally, the Technical Sciences Department (Muszaki Tudomanyok Osztalya) of the Academy had about 100 committees working on problems involved in the socialization of industry. Recently, the department has been reorganized and it now has about 20 main committees directly subordinate to it. The department now has a new basic research unit for supporting technological development, the Technical Physics Institute (Muszaki Fizikai Intezet). In 1957, research was progressing in 63 university faculties as well as in the Metering Technology and Instrumentation Institute (Merestechnikai es Muszerugyi Intezet) and in the Geophysical, Geodesic, and Geochemical Research Laboratories (Geofizikai-Geodeziai- es Geokemiai Kutato Laboratoriumok). Twenty-five of the 63 faculties were organized into three work cooperatives -- for construction and transportation, for metallurgy, and for mining. In 1957, 105 researchers and 215 other key personnel were working in the institutes of the department and the yearly budget was 9.5 million forints.

The work of the Chemical Sciences Department (Kemai Tudomanyok Osztalya) of the academy includes research on the structure of gels, adhesion of liquids to solids, absorption of binary liquid mixtures, infrared spectroscopy, electrolyte solutions, and electrokinetic processes. The Isotope Laboratory of the Louis Kossuth Scientific University in Debrecen is equipped for the large-scale production of radioactive isotopes. Work in organic chemistry includes research on peptides, synthesis of seriologically active mesopolyglutamic acid, synthesis of antitubercular polypeptides, and the study of the mechanism of production of N-glucosides. Work being done at the Central Chemical Research Institute (Kozponti Kemiai Kutato Intezet) includes investigations on gas adsorption, use of an electronic analogue computer to analyze chemical processes, and study of the polymerization kinetics of macromolecular groups.

The Biology Group (Biologiai Csoport) of the academy has a number of institutes. The Genetics Research Institute (Genetikai Kutato Intezet) is working on microbe and plant genetics. The Biochemistry Institute (Biokemiai Intezet) is working on the connection between function and structure of proteins. The Tihany Biological Research Institute (Tihanyi Biologiai Kutato Intezet) is working on increasing the productivity of Hungarian water life. In 1957, the Vacratot Botanical Institute was transformed into an area research laboratory. Most of the research of the Biology Group is done in university faculties.

Foreign honors received by academy members since the last general meeting include the following: Academician Rezso Manninger was elected a member of the Agricultural Academy imeni Lenin of the Soviet Union and Academician Antal Tarczi-Hornoch was elected a member of the Freiberg Mining Academy.

After the defeat of the counterrevolution, the Academy of Sciences USSR gave several million forints' worth of instruments to the Hungarian Academy, including an electron microscope and an infrared spectrograph.

"From the Life of the Hungarian Academy of Sciences -- Concerning the 1957 General Meeting"; Budapest, Magyar Tudomany, Jan-Feb 58, pp 49-54

Sitting in the presidium for the meeting were Dr Ferenc Muennich, First Deputy Premier of the Revolutionary Worker-Peasant Government and a member of the Political Committee of the Hungarian Socialist Workers Party; academician Istvan Rusznyak, president of the Hungarian Academy of Sciences; Lajos Ligeti, vice-president of the academy; Corresponding Member Geza Bognar, deputy first secretary of the academy; academy secretaries Gyula Hevesi, Lajos Jamossy, and Mate Major; and Corresponding Member Istvan Soter.

Corresponding Member Laszlo Boka gave the department secretary's report for the Linguistic and Literary Sciences Department. Academician Imre Szabo gave the department secretary's report for the Social and Historical Sciences Department. Academician Gyorgy Hajos gave the department secretary's report for the Mathematical and Physical Sciences Department. Andras Somos gave the department secretary's report for the Agricultural Sciences Department. Corresponding Member Pal Gomori gave the department secretary's report for the Biological and Medical Sciences Department. Academician Sandor Geleji gave the department secretary's report for the Technical Sciences Department. Academician Laszlo Erdey gave the department secretary's report for the Chemical Sciences Department. Academician Imre Toro gave the group secretary's report for the Biological Group.

The general meeting expressed its thanks to President Istvan Rusznyak and to First Secretary Tibor Erdey-Gruz for their effective activities during the recent difficult times. Academician Istvan Rusznyak was elected to continue as president and Academician Ferenc Erdei was elected new first secretary.

207. Work of Scientific Institutes of Debrecen University in Hungary

"Concerning the Scientific Work of the Natural Sciences Faculty of the Lajos Kossuth Science University [Debrecen]," by Dr Bela Gyires, Docent, University of Debrecen; Budapest, Felsooktatasi Szemle, Jul-Aug 58, pp 400-409

Today, 9 years after the establishment of the Natural Sciences Faculty, the University of Debrecen has 18 departments in the natural sciences. Of these, the Departments of Mineralogy and Geology, Meteorology, Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Applied Chemistry, Experimental Physics, Theoretical Physics, Applied Physics, Zoology, Botany, and Anthropology do their work in separate institutes. In addition, there is one combined Institute for Physical and Descriptive Geography and one combined Institute for all the Mathematical Departments (geometry, algebra, probability, and applied mathematics and analysis).

The Mineralogy and Geology Institute (Asvany- es Foldtani Intezet) is currently studying domestic volcanic rocks. The director of the institute, Prof Aladar Foldvary, is engaged in special work in connection with ores and other mineral materials for various mineral raw material committees of the Council of Ministers. The institute has great difficulty in obtaining equipment.

The Zoology Institute (Allattani Intezet), directed by Docent Geza Zilahi-Sebess [or Sebess Geza Zilahi], is working on 18 different sections of a work titled A Magyarorszag Allatvilaga (The Animal World of Hungary). The institute received a commission from the Tisza Research Institute (Tiszakutato Intezet) to prepare a study on the insects of the Tisza region. It has prepared a study on the life history of the hempseed insect. In cooperation with the Pharmacology Institute of the Medical University (Orvosegyetem Gyogyszertani Intezete) it has contributed significant work in connection with the effect of ascaris petehomogenizatum on tumorous animals.

The Botany Institute (Novenytani Intezet), directed by university instructor Arpad Haraszty, is engaged in research in four major areas. In the area of paleobotany, it is conducting microscopic examinations of Rudabanya brown coal to cast light on the relationship of paleoclimatic conditions to domestic Pliocene flora. Research in plant anatomy and histology is concentrated on the study of root formations, especially on the development of extraxylem wood bodies in roots of plants belonging to the carnation family. Biological and biochemical research is being conducted on problems connected with the death of plants due to drying. The institute is also participating in the botanical mapping of the Sator mountains.

The Anthropology Institute (Embertani Intezet) is one of the best equipped and has one of the best libraries of the several institutes. But it has had no director, and for years it has been housed in a very crowded area.

The Experimental Physics Institute (Kiserleti Fizikai Intezet) has been affiliated with the Natural Sciences Faculty since 1950; it was previously an institute under the medical faculty. It is engaged in research in four major areas. The present chief of the institute, Prof Sandor Szalay, began his study of light atomic nuclei in the 1930s. The research involves gamma and neutron radiation of light atomic nuclei in an excited state; using various spectrometers, the researchers investigated nuclear levels and decay laws. The Mineralogy and Geology Institute, and the Medical-Chemical Institute (Orvosi Vegytani Intezet) are studying domestic uranium ores and their processing technology. The Experimental Physics Institute is also cooperating with the Biological Institute (Elettani Intezet) of the Medical Faculty on the use of radioactive isotopes in a quantitative study of histochemical processes. These researchers have also done work on the operation of protective mechanisms effective against particles which penetrate living tissue; colloid granules tagged with radioactive isotopes were used. The fourth area of research, in cooperation with the Meteorology Institute (Meteorologiai Intezet), involves measurements of radioactive contamination in the atmosphere resulting from the explosion of atom bombs. The Nuclear Research Institute (Atommag Kutato Intezet) of the Hungarian Academy of Sciences grew out of the Experimental Physics Institute and the experiments on nuclear reactions using scintillation counters are done in the building of the original institute.

The Applied Physics Institute (Alkalmazott Fizikai Intezet) was formed in October 1956. It has not engaged in research work as yet. The present director Prof Gyorgy Orban, performed his research on ionization instruments for use in the examination of thyroid function using I131, work on neutron dosimetry, and on the design of an 800-kilowatt cascade generator while at the Nuclear Research Institute.

The Theoretical Physics Institute (Elmeleti Fizikai Intezet) under Docent Rezso Gaspar is working on quantum chemistry. The researchers are working on the theory of the binding of biatomic and polyatomic molecules. They have succeeded in analyzing bonds even in the case of several heteropolar and homopolar molecules and they have noted the more important properties characteristic of these molecules. The institute is also conducting research on the theory of solids and the electron structure of semiconductors. The institute was commissioned by the Vacuum Technology Laboratory (Vakuumtechnikai Laboratorium) of the Technical University [Budapest] to develop certain electrode equipment for measuring electrostatic potentials. The problem was solved successfully.

The Geographic Institute (Foldrajzi Intezet) has two directors: Laszlo Kadar, university instructor of physical geography, and Andor Kez, university instructor of descriptive geography. Geographic research includes work on the economic geography of the Nyirseg [the Nyir district in northeastern Hungary], on the natural geography of northern Trans-Tisza, on theoretical problems of surface formation (erosion and glaciation), and on geography teaching problems. The Meteorology Institute under university instructor Denes Berenyi was originally part of the Geographic Institute.

The Inorganic Chemistry Institute (Szervetlen Kemiai Intezet), directed by university instructor Pal Szarvas, is working in two major areas. One deals with titanium, a study of its properties and the technology of titanium metal production. The researchers have worked on catalytic microindicators for titanium and have improved the colorimetric methods for the more useful peroxides by means of phosphite separation. There has been much interest abroad regarding their methods for analyzing titanium steels, published in 1955. They have studied the formation and properties of titanium esters and the ascorbic acid reaction. They are presently studying the electrochemical behavior of titanium. The second major area involves chemical processing problems of material for atomic reactors. The researchers are studying the chemistry of the lanthanides. The experience gained here should be usable later in studies on the actinites. They have worked out a definition of cerium sensitive colorimetry and have further developed separation methods for lanthanide compounds. However, they are having great difficulties here due to lack of equipment. Minor researches include work in the chemistry of isopolar acids and in paper chromatography.

The Organic Chemistry Institute (Szerves Kemiai Intezet), directed by university instructor Rezso Bognar is engaged in chemical analyses of natural organic compounds. There are four major areas of research. Basic research on simple carbohydrate derivatives, namely oxygen and nitrogen glucosides. The institute has examined the "transglucolysis" reaction and has determined that the nitrogen-glucoside of simple sugar can exchange its nonsugar or sugar component for components of similar structure. The

researchers are also investigating the production of heterocyclic compounds from sugars, and the oxidation of sugar alcohols into sugar and sugar derivatives. The second problem area concerns the examination of flavonoids and isoflavonoids, or rather their oxygen glucosides. They have produced several basic compounds, e.g., "leucoautocyanin," which provide data on intracellular oxidation and reduction transformations. This research has also led to development of an industrial production technique for vitamin p "rutin." A third area of research involves poppy alkaloids, undertaken partly for the Tiszavasvar Alkaloid Factory (Tiszavasvari Alkaloida Gyar). Industrial techniques for production of thebaine, codeine narcotine, and narceine have been developed and other derivatives are already in production, e.g., Dicodid, Acedicon, Apomorphine, and Nalline. Other alkaloid research is aimed at the discovery of basic vegetable materials for the production of steriod hormones. The fourth problem area concerns the study of antibiotics and antimycotic materials. This work is only 6 months along, and is being carried out in cooperation with the Hajdusag Pharmaceutical Factory (Hajdusagi Gyogyszergyar) and the Pharmacology Institute (Gyogyszertani Intezet). They have developed the antifungal material produced by the factory, "flavofungium," and they have developed crystalline desertomycin, a new antibiotic.

The Physical Chemistry Institute (Fizikai Kemiai Intezet), directed by University Instructor Lajos Imre, is working on applied nuclear chemistry. This research, done from the viewpoint of the kinetics of heterogenous systems, is especially concerned with the technological requirements for the production of noncarrier radioactive isotopes. The researchers discovered general facts concerning the establishment of transitional layers characterizing the phase zones of heterogenous systems. They have developed a statistical thermodynamic theory for these transitional layers. This work may lead to a solution of the catalysis problem.

The Applied Chemistry Institute (Alkalmazott Kemiai Intezet) was established in 1953 but began work only in 1955 under the direction of Docent Bela Lutter. The researchers are studying grain proteins, primarily a quantitative and qualitative analysis of the amino acids occuring in flour protein. A related series of experiments deals with the effect of rye flour on the development of aleurone. Another area of research deals with the enzyme content of flour. The institute is cooperating closely with the Debrecen Quality Examination Institute (Debrecen Minosegvizsgalo Intezet) and with the Demecser Starch Factory (Demecseri Kemenyitogyar).

The Meteorology Institute (Meterologiai Intezet), directed by university instructor Denes Berenyi, is engaged in work on agrometeorology and climatology. The research in agrometeorology involves a statistical study of the relationships between weather and rye and wheat growth, and a microclimatology study of plant ecology and climate.

The Mathematics Institute (Matematikai Intezet) was formed in 1925 under the leadership of university instructor Otto Varga [apparently still director of the Institute] but it had virtually no personnel or library facilities until after the liberation. It now does work on four areas. In geometry, the researchers are working on the metric and nonmetric generalization of theorems in differential geometry. In algebra, research concerns mainly the theory of Abelian groups. In analysis, research concerns mainly the theory of functional equations, their algebraic relationships, and their use in probability and geometry. Docent Janos Aczel, chief of the Analysis Section, is preparing a monograph for the international mathematics series "Lehrbucher und Monographien aus dem Gebiete der exakten Wissenschaften" (Textbooks and Monographs in the Field of the Exact Sciences). The probability section of the institute, under Docent Bela Gyires, is working on the law of large numbers and boundary determination factors. The applied mathematics section develops numerical and graphical methods for various institutes and plants in Debrecen.

The Natural Sciences Faculty has two regular publications: the Acta and Publicationes Mathematicae. As of 20 June 1956, the faculty had prepared 6,400 works by 149 persons. These works were as follows: 578 in mathematics, 120 in experimental physics, 110 in theoretical physics, 60 in physical chemistry, 138 in organic chemistry, 55 in inorganic chemistry, 9 in applied chemistry, 655 in geology, 1,115 in botany, 1,825 in zoology, 175 in anthropology, 1,200 in geography, and 360 in meteorology. Seven of the faculty's present or former professors have received Kossuth Prizes and five are [or were] members of the Hungarian Academy of Sciences.

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